STATEMENT OF WORK

FOR

NATO IMPROVED LINK ELEVEN (NILE)

IN-SERVICE SUPPORT PHASE

CONTRACT

Prepared by: NILE PMO

REVISION HISTORY

Version	Reason for Change	Date
Draft	---	
V1	Final Version for RFP	03. May 02
V2	Alignment with Directives	23. May 02
V3	Comments incorporated	07 June 02
V4	Additional Comments	17 June 02

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1   SCOPE

This Statement of Work (SOW) for the In-Service Support (ISS) phase defines the requirements for the Modification, Maintenance, and Configuration Control of the NATO Improved Link Eleven (NILE) products, including the System Network Controller (SNC) Software, some components of the Multi-Link Test Tool (MLTT) Software, the Nile Reference System (NRS) Software and Hardware, and associated documentation, resulting from the NILE development Project. Software and hardware engineering technical services to the Government are also required in this contract.

2   BACKGROUND

1   NILE is a cooperative development program among a group of participating NATO nations. The objective of the Design and Development (D&D) phase of the NILE program has been to design a system consisting of a computer-to-computer, digital data link among Tactical Data System (TDS) equipped platforms, which meets the NATO Staff Requirement for NILE, and to develop common specifications and project information sufficient to enable the participating nations to procure NILE systems which will be interoperable and compatible with those of other nations. NILE has been designated Link 22 by NATO.

2   The objective of Sub-phase 2 of the D&D phase has been to design, develop, build, and test a System Network Controller (SNC), a NILE Reference System (NRS) and a Multi-Link Test Tool (MLTT) that meets the requirements of the specifications referenced herein, and to develop sufficient technical data to enable each participating nation to produce and maintain the SNC, NRS and MLTT, as part of their national Link22 implementation programs.

3   The SNC provides a common operational software that is compatible among the seven NILE nations (CA, FR, GE, IT, NL, UK, US). The NRS is a test tool, which will enable compatibility testing of Link 22 implementations by the participating nations. The MLTT is envisioned as the primary means by which Link 22 Interoperability will initially be validated and will be utilized throughout the In-Service Support (ISS) life phase to ensure continued interoperability of Allied forces.

4   These Link 22 system components necessitate the use of a specific Link Level COMSEC device (LLC) to provide communication security services at the link level for the Link-22 System. This cryptographic equipment also provides time-of-day (TOD) based encryption and decryption services for network messages sent over multiple NILE transmission networks.

5   The objectives of the In Service Support Phase (ISS) are to provide In-Service Support for, maintain commonality of, and pursue modifications resulting from revised user requirements and experiences of initial implementations to the products of the NILE Project including the System Network Controller (SNC), NILE Reference System (NRS), Multi Link Test Tool (MLTT) and associated documentation.

3   OBJECTIVES

1   This Statement of Work (SOW) defines the effort required from the Contractor for the following Tasks: (a) analyze and develop specific SNC and NRS software evolution identified in Annex A (modification tasks); (b) correct SNC and NRS, software and hardware defects arising during the ISS Phase (correction tasks); and (c) support NILE nations in their integration efforts of the NILE components (engineering support tasks).

2   The NILE In-Service Support phase management strategy, illustrated by Figure 1 – Appendix A, envisions a multiple phase plan and engineering service support CLIN over a contract period including at least the following three (3) distinct phases:

a   Phase One (1), covering:

  1.   Task One (1). Full Implementation of a first set [CORE1] of modification items leading to an updated product baseline, labeled "**Block One**" release,
  2.   Task Two (2). Analysis and Design only, of a second set [CORE2] of modification items,

b   Phase Two (2), covering:

  1.   Task One (1). Full Implementation of a third set [CORE3] of modification items, and results from Phase 1-Tasks 2 and d. below, leading to an updated product baseline, labeled "**Block Two**" release,
  2.   Task Two (2). Analysis and Design only, of a fourth set [CORE4] of modification items,

c   Phase Three (3), covering:

  1.   Task One (1). Full Implementation of a fifth set [CORE5] of modification items, and results from Phase 2-Tasks 2 and d. below, leading to an updated product baseline, labeled "**Block Three**" release,
  2.   Task Two (2). Analysis and Design only of a sixth set [CORE6] of modification items,

d   Engineering Support Task, covering:

  1.   Engineering Support services representing a "level of effort per year" for the duration of the contract and limited to system engineering, investigative, technical and maintenance support services to the Government on Link 22-related matters.

3   Throughout this SOW, unless specified otherwise, the term "SNC" implicitly encompasses all existing SNC variants as defined at Paragraph 5.2.6.1 – Table 5-1, and Annex C – Paragraphs 3.1, 3.2 and 3.6. Similarly, the term "NRS" implicitly

encompasses the SG (Scenario Generator) CSCI, NRS HWCI and all existing variants of the MS (Media Simulator) CSCI as defined at Paragraph 5.2.6.1 – Table 2 and Annex C – Paragraphs 3.3, 3.4, 3.5 and 3.6.

4   Throughout this SOW, the terms "Contractor" and "ISS-Contractor" refer to the contractor selected for developing and maintaining the NILE products during the ISS Phase, the term "Government" refers to the United States Government (encompassing the NILE Program Management Office and the NILE nations). The term "MLTT-ISEA" refers to the In-Service Engineering Agent-entity (e.g. SSC/NCTSI) contracted by the Government for supporting the overall MLTT maintenance activities out of scope of this Statement Of Work. Figure 1 below provides a high level identification of the areas of the ISS-Contractor responsibilities.
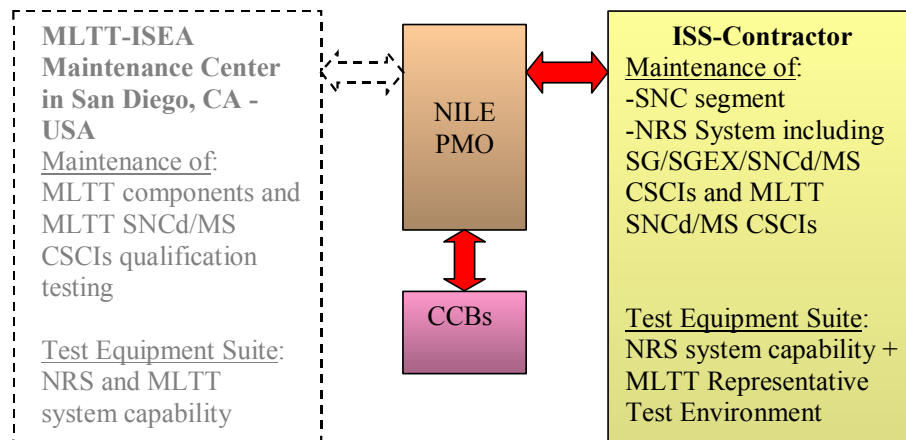
Figure 1:   **High-Level Identification of support and test Equipment required for organizational-level maintenance Items**

5   The Contractor is required only to modify and execute verification and test stages of approved changes up to the Test Readiness Reviews (TRR), for the MLTT SNCd (SNC diamond) CSCI and MLTT MS CSCI variants of SNC and MS software respectively. A third party (e.g. MLTT-ISEA) will perform the qualification phase of a change at MLTT maintenance center with the support of the ISS-Contractor. This effective qualification phase may be undertaken a few months after the TRR milestone per Government direction. The Contractor **shall**[1] immediately correct any defects in the modified MLTT SNCd or MLTT MS CSCIs, identified during the qualification phase.

6   Phase One (1) tasks **shall**[1] include at least items specified in Annex A– Paragraphs 1 and 2 (see Appendix A, Figure 1 for details).

7   Phase Two (2) tasks **shall**[1] include at least items specified in Annex A– Paragraphs 3 and 4 (see Appendix A, Figure 1 for details).

8   The Contractor is expected to analyze, design, implement, integrate and test the required modifications to produce an updated version, as applicable, of the SNC and/or NRS.

9   Amendment of the current NILE baseline software, hardware and documentation **shall**[1] be handled in accordance with the approved NILE Configuration Management (CM) process as specified in Paragraph 6 and Annex B of this SOW.

10   The software modifications will be validated in the NRS and/or MLTT environments depending on its nature, and delivered to the Government as an incremental version from the baseline version. Effective implementation by the NILE community of the latest version will be a national decision and may occur sometime after the "block" delivery.

11   The SOW also covers systems engineering, investigative and technical support services to the Government on Link 22 system-related matters. A hotline is also required from the Contractor, to that effect. The Contractor **shall**[1] be aware of the need to maintain current knowledge to support the system engineering tasks. The Contractor **shall**[2] provide identification of issues and problems with the specifications, implementations and overall Link 22 system to enable the Government to achieve efficient, effective and interoperable Link 22 systems.

4   APPLICABLE DOCUMENTS

4.1.   Specifications

4.1.1.   Functional Baseline

The Functional baseline data are specified in Annex C – Paragraph 2.

4.1.2.   Allocated Baseline

The Allocated baseline data are specified in Annex C – Paragraph 2.

4.1.3.   Product Baseline

The Product baseline data are specified in Annex C – Paragraph 2

4.2.   Standards

MIL-HDBK-61A(SE)	Configuration Management Guidance February 2001
MIL-PRF-49506	Performance Specification Logistic Management Information 11 November 1996
STANAG 4107	Mutual Acceptance of Government Quality Assurance Edition 6, Amendment 1 28 April 1998
MIL-STD-882D	DEPARTMENT OF DEFENSE Standard Practice for System Safety 10 February 2000
ANSI/EIA 649	National Consensus Standard for Configuration Management 10 July 1998
AMSG 719	Installation of Electrical Equipment for the Processing of Classified Information

4.3.   Other documents

ISO 9001 Quality Management Systems – Requirements Third Edition
15 December 2000

ISO 10007 Quality Management-Guidelines for Configuration
Management for SNC and NRS Development
1995

ISO/IEC 8652 Information technology, programming languages – Ada
(ISO/IEC 8652: 1995) with COR.1: 2000 Ada Reference
Manual
15 June 2001

IEEE/EIA 12207 Industry Implementation of International Standard ISO/IEC
12207 – 1995 (ISO/IEC 12207) Standard for Information
Technology – Software Life Cycle Process
01 March 1998

5   REQUIREMENTS

₁   The Contractor **shall**^(1) analyze, design, implement, test and deliver upgraded versions of the Government furnished NILE System Network Controller (SNC) Software, NILE Reference System (NRS) test tool software/hardware and *selected components* of the Multi-Link Test Tool (MLTT), incorporating upgraded capabilities specified in this SOW. Final acceptance testing of the modified SNC and NRS products **shall**^(2) be conducted at the Contractor's facility prior to shipment to the Government. Additionally, the Contractor **shall**^(3) provide analysis, design, engineering and technical support services to the Government and **shall**^(4) maintain all Configuration Items (CI) and update the designated documentation baselines.

₂   The Contractor will establish an SNC, NRS and MLTT "commercial" development, integration and test environment to fulfill requirements of this SOW.

₃   The Contractor **shall**^(1) also generate sufficient technical data to enable each participating nation to maintain the SNC and NRS, as part of their national NILE, or Link 22, implementation program.

5.1.   Project Management

5.1.1.   Program Structure

The Contractor **shall**^(1) establish and maintain an effective program management structure to oversee execution of tasks directed by this SOW. The Contractor **shall**^(2) designate a single program manager who **shall**^(3) have overall responsibility for control and coordination of all work performed. This manager **shall**^(4) act as the single focal point within the Contractor's activity for all required program status information.

5.1.2.   Program Planning and Control

₁   The Contractor **shall**^(1) identify, plan, organize, direct, coordinate, and control activities necessary to accomplish overall contract requirements. The Contractor **shall**^(2) establish a formal organization responsible for accomplishing the tasks outlined in this SOW. The Contractor **shall**^(3) ensure that all plans and procedures required by this SOW and the CDRL approved by the Government, are adhered to by the Contractor and, if any, his sub-Contractors. A clear line of project authority **shall**^(4) exist between all organizational elements and the program manager. Each SOW task **shall**^(5) be identified against one or more positions or elements within the Contractor's (to include sub-contractors) organization that **shall**^(6) perform the corresponding work. The Contractor **shall**^(7) appoint and maintain, throughout the duration of the contract period, a list of key personnel who have management and task accomplishment responsibility, including the key personnel of the sub-contractors to ensure expeditious transfer of appropriate technical data among sub-contractors and associate Contractors.

₂   The Contractor **shall**[(1)] document, in a tailored Program Management Plan (PMP), management (and associated organizational chart), cost, engineering, logistics and software development plans. This single document **shall**[(2)] include a CWBS which represent how the Contractor plans to accomplish the entire contract work scope, consistent with the Contractor's internal organizations and processes. The CWBS will serve as the framework for contract planning, budgeting, and reporting of cost and schedule status to the Government.

₃   The Contractor is encouraged to review and reuse as much as possible data from the Sub-Phase 2 NILE PMP, referenced in Annex C, Paragraph 2.

₄   The PMP **shall**[(1)] provide necessary information for planning and control of cost, measurement of performance (value for completed tasks), and generation of timely and reliable information for input into the Cost / Schedule Status Report (C/SSR).

₅   The Contractor **shall**[(1)] identify and implement internal procedures/organization necessary to ensure internal coordination for the activities that are part of this contract. The Contractor **shall**[(2)] identify a single authority who will interface, as directed by and under control of the NILE PMO, with the other entities participating to the NILE ISS-Phase including:

   a   Government Configuration Management fora (CCB, CCRB); and
   b   Entity in charge of implementing MLTT system evolution (e.g. Naval Center for Tactical Systems Interoperability [NCTSI]); and
   c   National NILE segments integrators, as contracted by the Nation, who require it.

5.1.3.   Cost/Schedule Status Report (C/SSR)

The Contractor **shall**[(1)] provide, on the 25th of each month, reports detailing the integrated cost and schedule status of work progress on the contract. The report **shall**[(2)] be prepared using Contractor's format for planning work, controlling costs, measuring performance, and generating timely and reliable information as required by DFARS clause 252.242-7005, Cost/Schedule Status Report (C/SSR). The Contractor **shall**[(3)] also relate technical accomplishment with cost and schedule accomplishment in contract performance reports and meetings.

5.1.4.   Electronic Data Bases and Management Tools

The Contractor **shall**[(1)] manage data generated as part of the contract in data bases or with specific data management tools. Unless otherwise agreed to by the Government, data **shall**[(2)] be maintained in the following formats: Microsoft WORD for text and tables, Microsoft ACCESS for databases, Microsoft EXCEL for spreadsheets and Microsoft PROJECT for project schedules.

5.1.5.   Program Reviews

Use of video tele-conferencing (VTC) facilities may be required, should the geographical distance between the Government and Contractor's sites make face to face meetings inefficient in time and travel terms. The Contractor **shall**[(1)] detail their video conferencing facilities to the Government. The Government will determine the method of conduct of the specific meeting.

5.1.5.1.   Program Schedule

The Contractor **shall**[(1)] prepare and maintain a master schedule of events. Supporting schedules detailing the sub-events required to achieve milestones in the master schedule **shall**[(2)] also be prepared and maintained. Schedules **shall**[(3)] be keyed to the CWBS, and **shall**[(4)] be presented at In-Process Reviews (IPRs). Changes to the schedule **shall**[(5)] be highlighted, with reasons for changes. The Contractor **shall**[(6)] address the effect of changes on interrelated milestones. The status of program schedules **shall**[(7)] be briefed during reviews.

5.1.5.2.   Post Award Conference

The Contractor **shall**[(1)] host a Post Award Conference no later than one (1) month after contract award. The Government will establish specific dates in conjunction with the Contractor. The agenda **shall**[(2)] be developed by the Contractor and **shall**[(3)] include, but not be limited to, the following:

   a   Introduction and identification of key Government and Contractor management and engineering personnel,
   b   The Contractor's management organization, plans, procedures, and schedules,
   c   The Government's management organization, plans, procedures, and schedules,
   d   Government concerns,
   e   Contractor concerns,
   f   Status of GFE/GFI,
   g   Status of submittals and approvals of regulatory issues, i.e. export, security,
   h   Status of subcontracts, if any,
   i   Other Tasks established by the Government in conjunction with the Contractor.

The Contractor **shall**[(1)] prepare and submit minutes of the Post Award Conference.

5.1.5.3.   In-Process Reviews (IPR)

Commencing with the Post Award Conference at the Contractor's site, the Contractor **shall**[(1)] conduct IPRs. The Contractor **shall**[(2)] present and administratively support in-process reviews. All IPRs **shall**[(3)] be held at the Contractor's facility except as otherwise directed by the Government. The IPR frequency **shall**[(4)] be no more than one (1) per month until the completion of Phase 1 of the contract. Thereafter, the frequency

shall[5] be determined by the Government on the basis of the volume Tasks to be performed. The Contractor **shall**[6] develop agendas and minutes for the IPR. The Government **shall**[7] have the right to modify or add items to the IPR agenda. At the IPR, the Contractor **shall**[8] determine and report detailed program status information, keyed to the CWBS, CDRL, and CLIN, including eventual sub-contractor work. The Contractor **shall**[9] prepare and submit minutes of the IPR.

5.1.5.4.   Requirements Review (RR)

In lieu of the SRR/SSR process, a formal Requirement Review **shall**[1] be conducted, for each Task 1 and 2 activity of the three (3) phases defined in Paragraph 3. The RR may be held in conjunction with an IPR or an IPT. The Contractor **shall**[2] conduct an RR to address, at least, the following points:

a   Demonstrate the overall System Engineering Management activity and its output for responsiveness to the Statement of Work, the SNC Segment and the NRS System Specifications,

b   Demonstrate knowledge and understanding of the requirements by identifying conflicts, omissions, and risks associated with the Government provided specifications. Specify alternate designs and/or solutions to resolve conflicts, minimize omissions, and mitigate risks,

c   Demonstrate revisions of the functional baselines for the SNC and NRS and initiation of configuration control,

d   Identify the software development and maintenance environment proposed for the SNC and NRS software maintenance,

The Contractor **shall**[3] prepare and submit minutes of the RR.

5.1.5.5.   Design Review (DR)

In lieu of the PDR/CDR process, an informal Design Review **shall**[1] be held by the Contractor, for each Task 1 and 2 activity of the three phases, during an IPR or IPT. The DR **shall**[2] be held when the contractor has completed the initial design stage of the modifications, prior to Change Proposal production for each Task 1 activity. A further DR may be held for the Task 2 activity, if the tasks are not concurrently executed. The following considerations **shall**[3] be addressed:

a   Progress, technical adequacy and risk resolution of the selected design approach, compatibility with initial system performance and engineering requirements of the development specifications

b   Traceability from item requirements to functional requirements, and documentation impacts;

c   Sizing and timing analyses of the SNC and NRS modifications along with estimate of the size of the modification's source code;

d   Any hardware requirements or design issues that significantly impact the software requirements definition and allocation.

e   Determine that the detailed design satisfies the performance and engineering requirements of the development specifications,

f   Establish detail design compatibility among system components,

g   Control of the overall technical program risks associated with technical, cost, and schedule aspects, and

h   Adequacy of specific software documentation, which will be released, for coding and testing.

i   Manage obsolescence issues with respect to COTS platform equipment, development and test tools throughout the ISS contract.

j   Facilities, computer programs and personnel.

k   Revised estimates of effort to complete implementation, integration and test.

The Contractor **shall**[(4)] prepare and submit minutes of the DR.

5.1.5.6.   Test Readiness Review (TRR)

₁   A TRR **shall**[(1)] be scheduled, for each Task 1 of the three phases, prior to the conduct of both "formal" CSCI and Systems Qualification Tests. The Contractor **shall**[(2)] call for a TRR when confident that the amended software, test scenarios and test procedures are complete and ready for conduct. The purpose of the TRR is for the contractor to present enough evidence to allow the Government to authorize to proceed with the next phase of testing. The following considerations **shall**[(3)] be addressed:

a   Requirements Issues and Changes.

b   Acceptance Test Procedures, and Scenarios.

c   Software Test Resources and Tools.

d   Hardware and Support Environment.

e   Configuration Management and Software Quality Assurance.

f   Test Team.

g   Recommended Tests to Conduct for Formal CSCI/System Testing.

h   Known Software Problems.

i   Test Schedule.

2   As shown at Paragraph 7.3 – table 7-1, the CSCI TRR **shall**[1] address MLTT CSCIs (i.e. SNCd, MS), but SQT TRR shall not, as these components are handed-over to the MLTT-ISEA for integration into the MLTT, upon successful CSCI acceptance testing.

The Contractor **shall**[4] prepare and submit minutes of the TRR.

5.1.6.   Integrated Product Teams (IPT)

1   The Contractor **shall**[1] establish and participate in joint Contractor/Government Integrated Product Teams (IPTs) to resolve particular problems and issues.

2   IPT responsibilities **shall**[1] include, but may not be limited to: (a) monitoring of the accomplishment of program work and progress using information from all available sources, including cost and schedule data; (b) identification of technical and program risks, and formulation of risk mitigation recommendations; (c) expediting resolution of problems and clarifying issues.

3   The IPTs **shall**[1] communicate the status of their activities to the program managers and raise critical issues for discussion at IPR. The IPTs will be held at the Contractor's facility, except as otherwise directed by the Government, and organized on the case-by-case basis, according to the volume of Items to perform and problems to resolve.

The Contractor **shall**[1] prepare and submit minutes of the IPT.

5.1.7.   Risk Management

The Contractor **shall**[1] establish a risk management program that identifies and controls performance, cost, and schedule risks likely to occur in this effort. Planning for risk management **shall**[2] be documented in the Program Management Plan (PMP).

5.1.8.   Security Management

All work performed under this SOW must be performed in accordance with the appropriate paragraph of Section H of the Contract and the DD Form 254.

5.1.8.1.   Classified Technical Data

ₗ   The Contractor **shall**[1] identify and implement the appropriate organizations and procedures necessary to maintain the NATO Secret classification Level during modification and testing of particular system requirements (i.e.: UHF EPM medium parameters).

ₐ   These procedures **shall**[1] be established and submitted to the designated security authorities for approval. Coding, integration and testing activities **shall**[2] be organized in a way to minimize the use of classified parameters.

5.1.8.2.   COMSEC equipment

The Contractor **shall**[1] manage the use and storage of the NILE COMSEC device (i.e. Link Level COMSEC [LLC]) and key materials in accordance with established procedures for handling COMSEC material. Non-US Contractor use and storage of this equipment **shall**[2] be in accordance with the bilateral agreement between the Contractor's own Government and the US Government. Facilities used for modification and testing of the SNC and NRS **shall**[3] possess the proper accreditation prior to storage and processing of classified data.
Installation of COMSEC equipment **shall**[4] be performed in accordance with the requirements of AMSG-719.

5.2.   Engineering

5.2.1.   Detailed Task Definition

ₗ   During the In-Service Support Phase contract, the Contractor **shall**[1] be responsible for the following Tasks:

a   Conduct technical and support analyses and design of SNC and NRS modification pursuits and issues as assigned by the Government (e.g. NILE PMO);
b   Identify change requirements and recommend change proposals;
c   Support the PMO in the Configuration Change Review Board (CCRB) and the Configuration Control Board (CCB);
d   Code, integrate and test changes when approved; unless directed otherwise,
e   Analyze deficiencies identified within the SNC and NRS software versions;
f   Investigate possible deficiencies in the NILE systems, reported by individual NILE Participants in the course of their national NILE system integration, provided such items or services do not adversely impact NILE Project products or compatibility or interoperability among the NILE systems of the Participants; and
g   Track and mitigate software/hardware obsolescence and maintain interoperability among all identified platforms.

Additionally, the Contractor **shall**[(2)] conduct for all tasks:

h   Modify, implement and validate test cases to demonstrate the modified functionality, making full use of existing SNC and NRS CSCI and System Qualification Test procedures and scenarios; and

i   Update the applicable NILE Documents. Updates **shall**[(3)] be approved through the Configuration Management Change Proposal scheme as detailed in Annex B.

2   The annex A defines work packages and has been split into sub-tasks that describe individual areas of functionality, which require amendment.

3   The description of the tasks have been divided into those where a specific amendment is required, those where the required result is defined, but not the method of achieving it, thereby leaving the Contractor to analyze and define the most effective solution, and those where the Contractor is required to conduct a full analysis and present potential solutions to the problem. The Contractor **shall**[(1)] conduct evaluations of upgrade solutions through code modification and examination within the NRS test environment.

4   Where analysis and design proposals are stated, the Contractor **shall**[(1)] provide working papers to allow an interactive dialogue with the Government (e.g. NILE PMO), before any solutions are implemented. Working papers **shall**[(2)] be produced to support the RRs.

5   The Software Modification Process approach for Phase One, Two and Three is illustrated in Appendix B. The approach for Validation and Qualification process of SNC and MS software variants for MLTT is illustrated in Appendix C.

6   Where existing functionality is removed, the Contractor **shall**[(1)] "comment out" , not delete, the applicable lines of code, within the baseline software. The Contractor **shall**[(2)] amend the software design documentation to describe the "sidelining" of the existing functionality. The Contractor **shall**[(3)] amend the specification documentation to reflect the modified baseline requirements, deleting existing functionality requirements as necessary. The CM process will maintain the old versions of documentation.

5.2.2.   Software Development.

1   Modification of software **shall**[(1)] follow the guidance of the standards specified at Paragraph 4.2 and 4.3 or any tailored standard recommended in Contractor's proposal and approved by the Government. The Contractor **shall**[(2)] modify software and use the mandated computer platform types to meet the requirements outlined in this SOW. The Contractor **shall**[(3)] identify in the PMP those software management indicators to be used, and **shall**[(4)] collect, interpret, apply, and report on those indicators which provide a quantitative measurement of schedule and progress, quality, and technical adequacy of software modification.

₂ The SNC has been developed in a single software environment, Intel Pentium and Windows NT, and then modified to function in the other two (2) software and hardware environments, HP Series 9000 running HP UX (UNIX) and SUN ULTRA 5 running Solaris (UNIX). Full details of the baseline Software Development Plan (SDP) are provided in existing - NILE Program Management Plan [PMP] LGN 156-11-002 dated 12 January 2001and referenced at Annex C Paragraph 2 of this SOW.

5.2.2.1.   Software Modification Maintenance

During the period of performance of this contract, the Contractor **shall**[1] maintain, update, and/or modify computer software, hardware, or associated documentation that is either procured by the Contractor or provided as Government Furnished Equipment (GFE), Government Furnished Information (GFI), Government Furnished Property (GFP) or Government Furnished Material (GFM). The Contractor **shall**[2] also obtain data rights and/or licensing agreements, as required to modify, maintain and use NILE software.

5.2.2.2.   Software Language Requirements

The Contractor **shall**[1] perform the SNC/SNCd software modifications using Ada 95, as defined by ANSI/ISO/IEC 8652:1995. The software modifications to the NRS CSCIs **shall**[2] be performed using C++.

5.2.2.3.   Hardware Resources

Where new hardware is procured under this contract, the Contractor **shall**[1] select only hardware, which can be maintained and repaired via service organizations located in each NILE participating Nation for any additional or replacement modification facilities. The Contractor **shall**[2] deliver all information about procured or modified hardware to the Government IAW MIL-PFR 49506 specified at 4.2.

5.2.2.3.1.   Processing Capacity

The Contractor **shall**[1] estimate the modified SNC and NRS processing capacity using appropriate peak throughput scenarios. The estimated spare processor capacity **shall**[2] be presented at Design Review, and then verified during system qualification testing of final delivered software.

5.2.2.3.2.   Memory Capacity

The revised memory capacity and utilization for each Central Processing Unit (CPU) **shall**[1] be estimated at Design Review. Measurements of memory capacity and utilization for each CPU **shall**[2] be verified during system qualification testing.

5.2.3.   System Safety

The Contractor **shall**[1] establish and implement a System Safety Program IAW MIL-STD-882D specified in Paragraph 4.2. The Contractor **shall**[2] ensure that all safety warnings and cautions required to protect personnel and permit proper system operation and maintenance of the NRS are included in the appropriate locations of all equipment and technical manuals, in accordance with Section 4 of MIL-STD-882D.

5.2.4.   SNC and NRS System/Segment Design change

The Contractor **shall**[1] perform engineering design studies to define the modified design, configuration, and performance characteristics of the SNC and NRS software, in accordance with the requirements of the current System/Segment Specifications and the list of specified functional modifications in Annex A. The design **shall**[2] be carried to a level of detail such that the necessary modified segment components (including computer resources) and their functional characteristics are identified; the external and major internal hardware and software interfaces are characterized as to function; the physical layout of the segment is described, and feasibility, cost effectiveness, and reproducibility of the design are verified. If the core documents, specified at Annex C–Paragraph 2.1 are to be modified, change pages **shall**[3] be provided via NILE Change Proposal (NCP) and Specification Change Notice (SCN). Design changes resulting from modifications **shall**[4] be documented through company procedures/processes and delivered as Natural Work product (NWP). However, an update to the current SNC SDD **shall**[5] be provided upon SNC modification evolution(s). The contractor **shall**[6] deliver a Software Version Description (SVD) document to control and track the software release. The contractor **shall**[7] deliver a Software Product Specification (SPS) document that references the executable software, source files, and software support information, including build design information and compilation , and modification procedures for a CSCI.

The contractor **shall**[8] deliver, on electronic media, all the source and executable files, including any batch files, command files, data files or other software files needed to regenerate the executable software and to install and operate the software on its target computer.

5.2.5.   Technical Data Package (TDP)

The Contractor **shall**[1] generate and maintain a TDP which details all information and requirements pertaining to the upgrade, testing, installation, training, and support for the SNC, and NRS. The TDP **shall**[2] constitute a complete design disclosure of the SNC and NRS necessary for the Government to build an identical system via a third party. The TDP **shall**[3] include, but not be limited to, engineering design documentation, specifications, product drawings and associated lists, special tooling and test equipment drawings and associated lists, technical manuals, COTS manuals, source and object code listings, software documentation, test plans and procedures, installation drawings, support documentation, configuration changes. COTS manuals **shall**[4] consist of only the information that is normally supplied by the vendor. The Technical Data Package **shall**[5] not include any COMSEC/TEMPEST information or requirements. The

TDP **shall**[6] exactly represent the as-built configurations of the modified SNC and NRS that successfully completed System Acceptance Testing.

5.2.6.   Software Version Identification

1   The list of tasks and sub-tasks that will be CM-controlled in the ISS phase by the Government is specified in Annex A.

2   The SNC software, programmed in Ada 95, has been developed to run on three target platforms: a single processor Pentium II computer running Microsoft Windows NT, an HP workstation running HP-UX and a Sun workstation running Solaris.

3   The Operating Systems for the three computer platforms are:

   a.   Windows NT 4.0 with Service Pack 4 for the Pentium II computer,

   b.   HPUX 10.20 for the HP B180L computer, and

   c.   Solaris 2.6 for the Sun ULTRA 5 computer.

These operating systems are required for installation and correct operation of the SNC software.

 The SNC software has been implemented on the three following computer platforms:

   a.   266 MHz Pentium II processor with 64MB of memory,

   b.   180 MHz Hewlett-Packard (HP) B180L processor with 128MB of memory,

   c.   270 MHz Sun Ultra 5 processor with 128 MB of memory.

For information, the minimum hardware required for national SNCs implementation is defined in the following table:

CPU Type	Minimum Required Processor	Required RAM	Required Number of Free ISA or PCI Bus Slots
Pentium	266 MHz Pentium II or faster	128MB	3
H-P	HP model c3600 (552MHz) or faster	128MB	3
Sun	Sun Ultra SPARC III (600 MHz) or faster	128MB	3

Table 5-1:   **Minimum Hardware Requirements for Implementing an SNC**

4   The SNC♦ (read SNC Diamond) software is provided as part of the test environment and allows simulation of a complete Link 22 Super Network. The SNC♦ is hosted on up to four AMD 1GHz Athlon computers, each of which will simulate up to 32 SNCs. Each SNC♦ has re-used a large proportion of the SNC code.

5   The principal baseline software versions, currently established, are:

a   One SNC CSCI version;
b   One NRS / SNC♦CSCI version; and
c   One MLTT / SNC♦CSCI version.

6   The Table below lists the total number of CSCIs/Platform combinations to be maintained, namely up to five (5) versions for the SNC.

Item	*CSCI variant*	*Environment*	*Platform*	*Version*
1a	SNC	UUT	Intel	6.1
1b	SNC	UUT	HP	6.1
1c	SNC	UUT	Sun	6.1
2a	SNC♦	NRS	Intel	6.1
2b	SNC♦	MLTT	Intel	Version at Contract Award

Table 5-2:   SNC Software versions to maintain

7   The NRS SG and MS software, programmed in C++, has been developed to run on a combination of dual processor Pentium II and III computers running Microsoft Windows NT.

8   The principal baseline software versions, currently established, are:

a   One NRS / SG CSCI version;
b   One NRS / MS CSCI version; and
c   One MLTT / MS CSCI version.

9   The Table below lists the total number of CSCIs/Platform combinations to be maintained, namely up to two (2) versions for the MS and one (1) version for the SG.

Item	*CSCI variant*	*Environment*	*Platform*	*Version*
1	SG	NRS	Intel	20.0
2a	MS	NRS	Intel	4.03
2b	MS	MLTT	Intel	Version at Contract Award

Table 5-3:   NRS/MLTT Software versions to maintain

Note: The MS Software encompasses the MS♦(diamond) capability

10   All software requirements, design and interface design documents, source code, data and control files and CDRL documents will be placed under modification configuration control.

11   The configuration management plan **shall[1]** include configuration management processes and procedures for the NILE SNC and NRS software during the contract and by extension its life cycle. Configuration management and control process **shall[2]** be tailored following the guidance of Paragraph 6 and Annex B.

6   CONFIGURATION MANAGEMENT (CM)

The term "Configuration Baseline" refers to all baseline software, hardware and core documentation, as defined in Annex C Paragraph 2.1, and any evolution of these items through the life of this contract. This section details the Configuration Management requirements for the ISS phase. Annex B provides an expansion of the terms and processes described herein.

6.1.   Configuration Management Plan (CMP)

The Contractor **shall**[1] develop a Configuration Management Plan (CMP), incorporating the requirements of Annex B, aligning as much as possible with the Contractor's existing CM procedures. Furthermore the contractor is encouraged to extensively reuse appropriate parts from the Software Development Plan (SDP) of the existing PMP from Sub-phase 2 of the NILE Program, referenced in Annex C, Paragraph 2.1.

6.2.   Configuration Baselines

1   The CM of the baseline **shall**[1] be controlled at the following levels: functional, allocated and product. The Contractor **shall**[2] be responsible for maintaining the configuration baseline, identified as "Core" in Annex C, to accurately document the evolving configuration until the end of the contract. The Government will be responsible for approval of all updates to the configuration baselines.

2   The Government will update configuration baseline documents identified as "Government Responsible" in Annex C.

6.2.1.   Functional Baseline

The functional baseline documentation, describing the functional, interoperability, and interface characteristics of the NILE SNC and NRS products is specified in Annex C -Paragraph 2.1. They are attached to the contract and **shall**[1] be considered certified.

6.2.2.   Allocated Baseline

The allocated baseline documentation, including prime item development specifications, is specified in Annex C - Paragraph 2.1. These allocated configuration baseline documents resulting from the SNC and NRS development phase are attached to the contract and **shall**[1] be considered certified.
The NILE PMO is the approval authority for all changes to the allocated baseline.

6.2.3.   Product Baseline

The product baseline documentation is specified in Annex C - Paragraph 2.1; the product baseline software and hardware are specified in Annex C Paragraph 3.1, 3.2, 3.3, 3.4, and 3.6.

6.2.4.   Government Documentation Control

The versions of the Government documentation specified in Annex C – Paragraph 2.1 are expected to change during the conduct of the ISS contract.

6.3.   Configuration Control

The configuration control process **shall**$^{(1)}$ encompass the following:

6.3.1.   Configuration Management Information System (CMIS)

The contractor **shall**$^{(1)}$ implement and maintain a Configuration Management Information System (CMIS). The CMIS **shall**$^{(2)}$ be capable of producing Microsoft ACCESS compatible output and **shall**$^{(3)}$ be continuously available to the Government.

6.3.2.   Configuration Boards

6.3.2.1.   Configuration Control Review Board (CCRB)

₁   The Contractor **shall**$^{(1)}$ participate on the Configuration Control Review Board (CCRB) (a Government/Contractor forum chaired by the Government) to monitor the status and disposition of NILE software and hardware problems and pending Change Proposals (CP). The CCRB will review NILE Change Proposals (NCP), Problem Reports (PR), prioritize Trouble Reports (TRs) and establish consensus on feasible approaches to problem corrections(s), including the implementation of corrections. The Contractor **shall**$^{(2)}$ provide technical, cost and schedule data for any PR or NCP. The Contractor **shall**$^{(3)}$ generate an Engineering/NILE Change Proposal (ECP/NCP) for any pending modification item or TR according to the decision taken during the CCRB.

₂   CCRBs will be held at a Contractor's facility as necessary according to the volume of TRs to address. The use of VTC medium for meetings is recommended.

₃   Further details on CCRB structure and management of the process for P/TRs and NCPs are provided in Annex B of this SOW.

₄   An agenda **shall**$^{(1)}$ be developed by the Contractor prior each CCRB meeting.

₅   The Contractor **shall**$^{(1)}$ prepare and submit minutes of the CCRB meetings.

6.3.2.2.   Configuration Control Board (CCB)

The Configuration Control Board is a configuration control function for the nations. The Contractor will be invited, as necessary, to this board to clarify technical aspects.

6.4.   Website

₁ The Contractor **shall**[1] maintain a password protected, NILE website. Configuration management, data management issues, and documents **shall**[2] be maintained on the website. Only unclassified data will be posted.

₂ The Contractor **shall**[1] give the Governments of all NILE nations, their participating Contractors and NILE users, an access to the website. The NILE PMO will be responsible to grant access permission. As a minimum, all CDRLs in Appendix D, and documents in Annex C - Paragraph 2 **shall**[2] be posted on the web site and be downloadable.

₃ The Contractor **shall**[1] notify via email a list of addresses, provided by the Government, upon new items posted on the website.

₄ All business sensitive information will be not be posted on the website (e.g. cost, monthly status).

₅ Any time the Contractor's website is unavailable to the Government (e.g. server problems) for more than 48 continuous hours, the Contractor **shall**[1] provide the Government with an assessment of the problem and an estimated time when service will be restored. The Government may request delivery by email or on CD-ROM of any critical information.

₆ The NILE PMO will authorize the posting of any items on the website (i.e. meeting minutes, etc).

7   CONTRACTOR CONDUCTED TEST AND EVALUATION

7.1.   Test and Evaluation Program

The Contractor **shall**[1] provide the facilities, services, materials, and equipment required to test and evaluate the SNC and NRS according to the following criteria:

a   Software testing **shall**[1] be conducted in following the guidance of standard IEEE/EIA 12207 as specified in Paragraph 4.2.

b   The Contractor **shall**[1] provide all SNC and NRS hardware and software configuration items required to conduct the testing activities.

c   The Contractor **shall**[1] maintain all facilities and equipment at an optimum level of operation to minimize test delay. For this purpose, the Contractor **shall**[2] provide qualified personnel for hardware and software troubleshooting and maintenance.

d   The Contractor **shall**[1] deliver two Software Test Description (STD) documents: one each for the SNC and NRS. The STDs **shall**[2] encompass both CSCI and System Qualification testing. Existing CSCI and System Qualifications tests, which are reused, **shall**[3] be incorporated into the revised STDs.

e   The Contractor **shall**[1] conduct a sequence of testing that follows the testing phases of Computer Software Unit (CSU) testing, CSC Integration testing, System Integration testing, and System Qualification testing and **shall**[2] deliver two Software Test Report (STR) documents: one for the SNC and one for the NRS.

7.2.   General Rules for Testing

The following general rules **shall**[1] apply for all formal verification activities:

a   All Contractor conducted testing **shall**[1] be performed following the Government approved plans and procedures. Unlike CSCI and System Integration Test (SQT) phases where the Government is witnessing all test activities, test witnessing by Government representatives is not a requirement during CSU and Software Integration Test phases, but **shall**[2] be allowed and **shall**[3] be at the discretion of the Government, who **shall**[4] be notified of testing dates at least 30 days in advance. The Government will notify the Contractor of intent to witness individual tests. The Contractor **shall**[5] notify the Government at least five (5) days in advance whenever the start of any testing will be delayed and **shall**[6] concurrently notify the Government of the new start date.

b   The Contractor **shall**$^{(1)}$ prepare and submit test reports of testing activity results. Two documents **shall**$^{(2)}$ be delivered Ten (10) days after CSCI Tests: one for the SNC, one for the NRS, noting that the Scenario Generator and Media Simulator CSCIs are incorporated into the NRS. These will be hard copy amendments of the Acceptance Test Procedures. They **shall**$^{(3)}$ provide evidence that the tests were conducted, the results that were obtained, and bear the signatures of the personnel who conducted or witnessed the tests.

c   The Contractor **shall**$^{(1)}$ conduct retests of previously completed testing for which correction of a deficiency or any other modification affects the results of those previously completed tests. The selection of requirements for retesting is a joint Contractor and Government decision, with the Government having the final authority.

7.3.   Testing Requirements

₁   The Contractor **shall**$^{(1)}$ perform all necessary testing phases including Computer Software Unit (CSU) testing, CSC Integration testing, System Integration testing, and System Qualification testing to demonstrate to the Government that each individual CSCI and the overall SNC and NRS Systems meet the new requirements derived from the item list in Annex A and requirement items identified in the course of the contract.

₂   For the MLTT SNCd and MS CSCIs, the Contractor **shall**$^{(1)}$ only perform CSU testing and CSCI qualification testing phases . To fulfill these tasks, the Contractor **shall**$^{(2)}$ use the MLTT representative test environment seen as a suite of hardware and software COTS components capable of stimulating all MLTT SNCd and MS external interfaces so that updated SNCd and MS CSCIs can be qualified at ISS-Contractor site and presented for complete integration into the reference Multi-Link Test Tool residing at MLTT-ISEA site. . Upon successful completion of CSCI Qualification Tests which **shall**$^{(3)}$ be subject to formal approval by the Government (i.e. CSCI acceptance IPT), these two specific components along with their associated test results **shall**$^{(4)}$ be formally delivered to the Government who will pass them on to the MLTT-ISEA. The Contractor **shall**$^{(5)}$ be available to assist the MLTT-ISEA in conducting System Integration and System Qualification Testing of these two CSCIs and **shall**$^{(6)}$ be required to fix any PCRs found on the two CSCIs in the course of these activities (see Appendix C).

₃   The table 7-1 below presents the possible sequence of events within a specific development phase.
Key: Item (A) represents SNC CSCI and NRS HWCI/CSCIs, (B) represents MLTT SNCd and MS CSCIs, (I) represents the ISS-Contractor and (II) represents the MLTT-ISEA.

Reviews		Informal TRR		Formal CSCI Acceptance		Formal TRR	
Test Phases	CSCI Dry-Run Testing	↓	CSCI Qualification Testing	↓	CSCI / HWCI Integration & Test + System Dry-Run	↓	System Qualification Testing
Responsible	(I)	(I)	(I)	(I)	(I)	(I)	(I)
				MLTT CSCIs delivered to Gov^t			
Items					(B)	(B)	(B)
Responsible					(II) +(I) assistance	(II)	(II) +(I) assistance

Table 7-1:　　　　SNC/NRS/MLTT Test phases with major milestones

7.3.1. Hardware Platforms

The Contractor **shall**[1] develop a set of tests to verify the transportability of modified SNC software to the three hardware platforms identified in Paragraph 5.2.6.

8   INTEGRATED SUPPORT PLAN

1   The Contractor **shall**⁽¹⁾ develop and implement an Integrated Support Plan (ISP). This effort **shall**⁽²⁾ be conducted as an integral part of the modification process, with the intent of minimizing products life cycle costs and enhancing supportability.

2   The Contractor is encouraged to review and reuse as much as possible data from the Sub-Phase 2 NILE PMP – ISP Part, referenced in Annex C, Paragraph 2. The ISS Integrated Support Plan **shall**⁽¹⁾ address as a minimum, but not limited to, the elements in the sub-paragraphs below.

8.1.   System Technical Manual

The Contractor **shall**⁽¹⁾ provide appropriate update pages to the SNC and NRS system level technical manuals according to SNC and NRS implemented changes.

8.2.   Packaging, Handling, Storage, and Transportation (PHS&T)

The Contractor **shall**⁽¹⁾ establish PHS&T procedures that provide for safe and efficient packaging, handling, storage, movement, and protection of the hardware and software items. All activities, milestones, and planning **shall**⁽²⁾ be addressed in the Integrated Support Plan portion of the tailored PMP.

8.3.   Maintenance Support

8.3.1.   Maintenance Concept

The maintenance concept for Organizational level repair **shall**⁽¹⁾ be limited to replacement of modules such as circuit cards, power supplies, CRT screens, keyboards or parts, etc., while Depot level repair **shall**⁽²⁾ consist of repairing piece parts of these modules.

8.3.2.   Preventive Maintenance

The Contractor **shall**⁽¹⁾ support the preventive maintenance of this system for the duration of the ISS contract. The Contractor **shall**⁽²⁾ develop and implement any necessary additional procedures for preventive maintenance actions to be performed on a recurring basis, following amendment of the baseline.

8.3.3.   Corrective Maintenance

The Contractor **shall**⁽¹⁾ develop necessary additional corrective maintenance procedures that can be performed by those charged with the operation of the NRS hardware, following any amendment to the initial NRS environment.

8.3.4.   Software Repository

The Contractor **shall**[1] maintain files, updates, revisions, and upgrades under his configuration control during the period of performance. During this time, the Government retains the right to monitor and review, via the IPT process, any and all software information maintained by the Contractor. The Contractor **shall**[2] provide a final release at formal delivery for all software modified or purchased under this contract.

8.3.5.   Support and Test Equipment

The Contractor **shall**[1] recommend and provide any general purpose and special purpose electronic test equipment required for the operation and maintenance of the SNC and NRS hardware, including GFE items specified in Appendix F.

9   QUALITY ASSURANCE

9.1.   Quality Assurance Program

1   The Contractor **shall**[1] implement a Quality Assurance program adapted to the volume of items, following the guidance of ISO 9001 specified at Paragraph 4.3. The Contractor **shall**[2] apply the company's quality standard(s) and specification(s) to:

a   Internal management processes,
b   Ensure that best commercial practices and policies are in place and there is capability to audit that these practices and policies are being followed,
c   SNC and NRS baseline specifications compliance and requests for waivers or deviations,
d   SNC and NRS software upgrade,
e   Analysis and design documentation,
f   Acceptance test plans, procedures and reports,
g   Process improvement

At program reviews (IPR), the Contractor **shall**[3] demonstrate in detail how:

h   Benchmarks and metrics are established and controlled to ensure repeatable results,
i   Internal QA processes meet all applicable Government requirements stated elsewhere in this contract.

2   The quality assurance program **shall**[1] be documented, and all records associated with the establishment, implementation, and operation of the quality system made available for review and retention, if required by the Government. The Contractor **shall**[2] monitor the preparation, maintenance and compliance with work and inspection instructions as a function of the quality program. The Government may perform any

necessary inspections, verifications, and evaluations to ascertain conformance to requirements and the adequacy of the implementing procedures. Inspection and test records **shall**[(3)] , as a minimum, indicate the nature of the observations, number of the observations made and the number and type of deficiencies found. Data included in inspection and test records **shall**[(4)] be complete and accurate, and **shall**[(5)] be used for trend analysis and to assess corrective action effectiveness.

9.2.   Quality Audits

Quality audits will be performed to verify implementation of the Contractor's QA program. For software modified under this contract, the Contractor **shall**[(1)] support software quality audits of Contractor compliance to the Government's requirements. Software Quality Audits (SQA) **shall**[(2)] not exceed one (1) day. For planning purposes, at least two (2) SQAs **shall**[(3)] be performed per modified Computer Software Configuration Item (CSCI) per phase of the ISS contract. The Contractor **shall**[(4)] provide pertinent managerial and technical skills necessary to support SQAs and CSCI surveillance. SQAs **shall**[(5)] be conducted by the Contractor in accordance with a Government approved company's standard Audit Plan . The Contractor **shall**[(6)] correct any deficiencies discovered during the audit(s). For each SQA conducted, the Contractor **shall**[(7)] submit an Audit Summary Report to the Government.

10   CONTRACTOR TECHNICAL SERVICES

1   During the performance of the contract, and when tasked by individual delivery orders, the Contractor **shall**[(1)] provide technical/engineering services to nominated Government Agencies (i.e.: NILE PMO, National Integrators) with respect to tasks related to Annex A items and Link-22 System Engineering Elements. These services, see Engineering Support CLIN in RFP, **shall**[(2)] include at the minimum :

- a   Operation of the NRS components, SNC, SNCd, interfaces and ancillary equipment (i.e.: TOD card) on identified computer platforms (i.e.: Intel, HP, Sun);
- b   Investigation into Link-22 system issues requested via an Investigation Request (IR). The Contractor **shall**[(3)] review all incoming IRs for technical feasibility, validity, including schedule and cost impacts as directed by the Government.
- c   Planning and execution of integration testing, and field testing as requested (this assistance includes helping to develop test plans, test objectives, test set-up, and test criteria);
- d   Analysis and evaluation of SNC and NRS integration test results;
- e   Incorporation of hardware and software updates by retrofit;
- f   Problem verification, reporting, tracking and resolution, using the PMO designated tools and procedures.
- g   Purchasing hardware equipment, complementing the GFE list in Appendix F, necessary for SNC and NRS (including limited MLTT components) software maintenance object of this contract. The Contractor **shall**[(4)] provide the Government with the list of proposed items to be purchased within Two (2) months after contract award.

h   Establishing and maintaining the SNC, NRS and MLTT "commercial" development, integration and test environment, including the hardware identified in 10.g above.

i   Conducting an approximately one-week training session at the contractor's site to familiarize national participants with the Link 22 system, including when possible, System operational aspects, operation and use of the SNC, NRS, supporting ancillary equipment, and documentation.

APPENDIX A - NILE ISS PRODUCT MAINTENANCE PHASING

Task ID	Phase One (1)		Phase Two (2)		Phase Three (3)	
					Time →	
Task One (1) Full Implementation	**CORE1 Items** Composed of items from: Annex A/Para 1	**Block 1 Release**	**CORE3 Items** Composed of items from: Annex A/Para 3 and Core2 deliverables and up to 5 Problem Reports (PR), for a total volume estimated at up to 70% of Phase1/Task1 effort	**Block 2 Release**	**CORE5 Items** Composed of items from: Core4 deliverables and up to 5 Problem Reports (PR) for a total volume estimated at up to 80% of Phase2/Task1 effort	**Block 3 Release**
Task Two (2) Analysis and Design Only	**CORE2 Items** Composed of items from: Annex A/Para 2		**CORE4 Items** Composed of items from: Annex A/Para 4 and up to 15 Problem Reports (PR)		**CORE6 Items** Composed of items from: up to 20 Problem Reports (PR)	
Engineering Support services				Increasing Level of effort estimated at an average of 1,200 hours per year (see CLIN)		

Figure 2:   **NILE ISS Product Maintenance Phasing**

APPENDIX B - SOFTWARE MODIFCATION PROCESS - PHASE ONE (1) TASK ONE (1)
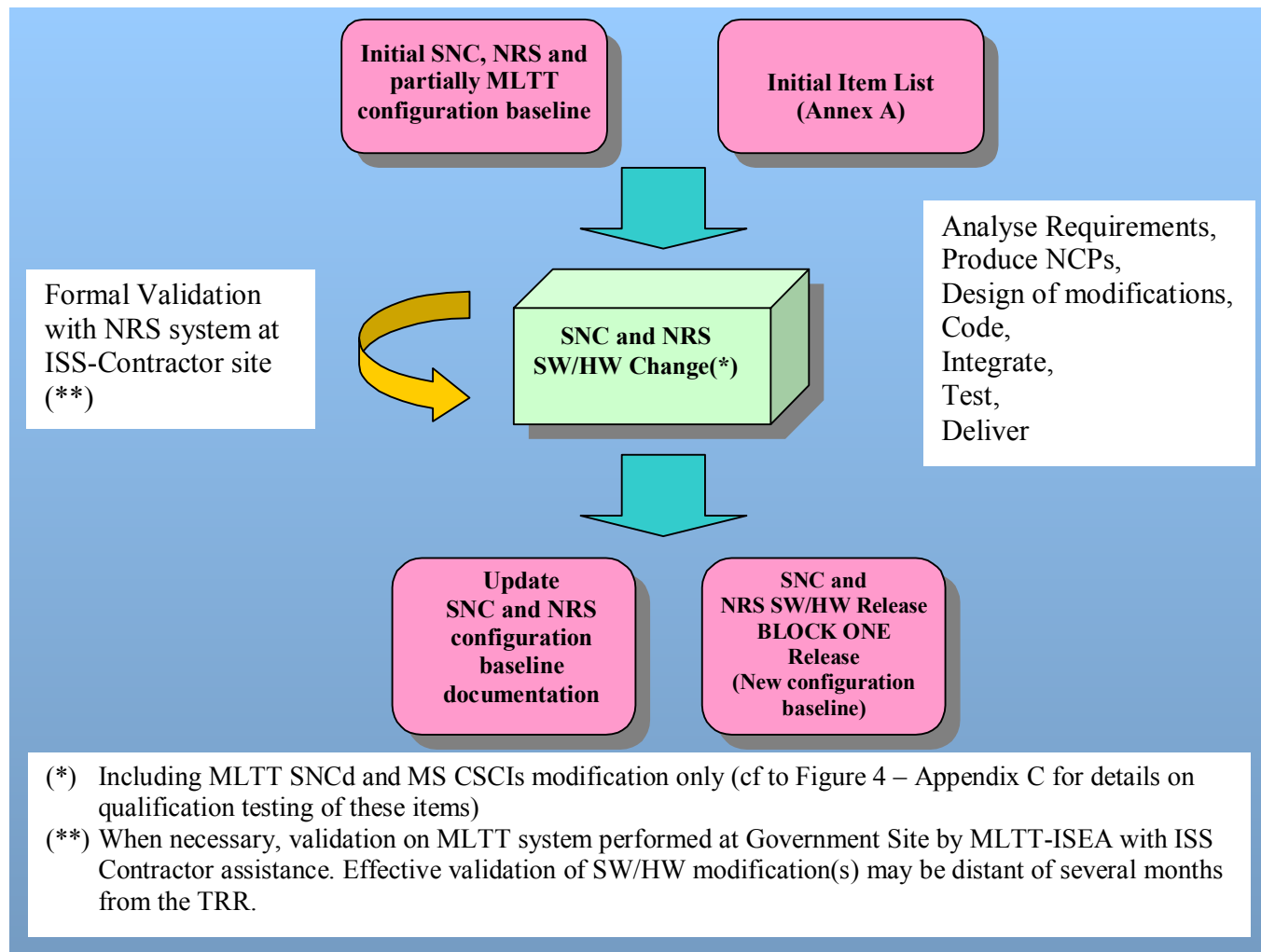
Figure 3:   **Software Modification Process - Phase One (1) Task One (1)**

APPENDIX B (Cont'd)- SOFTWARE MODIFICATION PROCESS – PHASE TWO ~ TASK ONE AND FOLLOW-UP
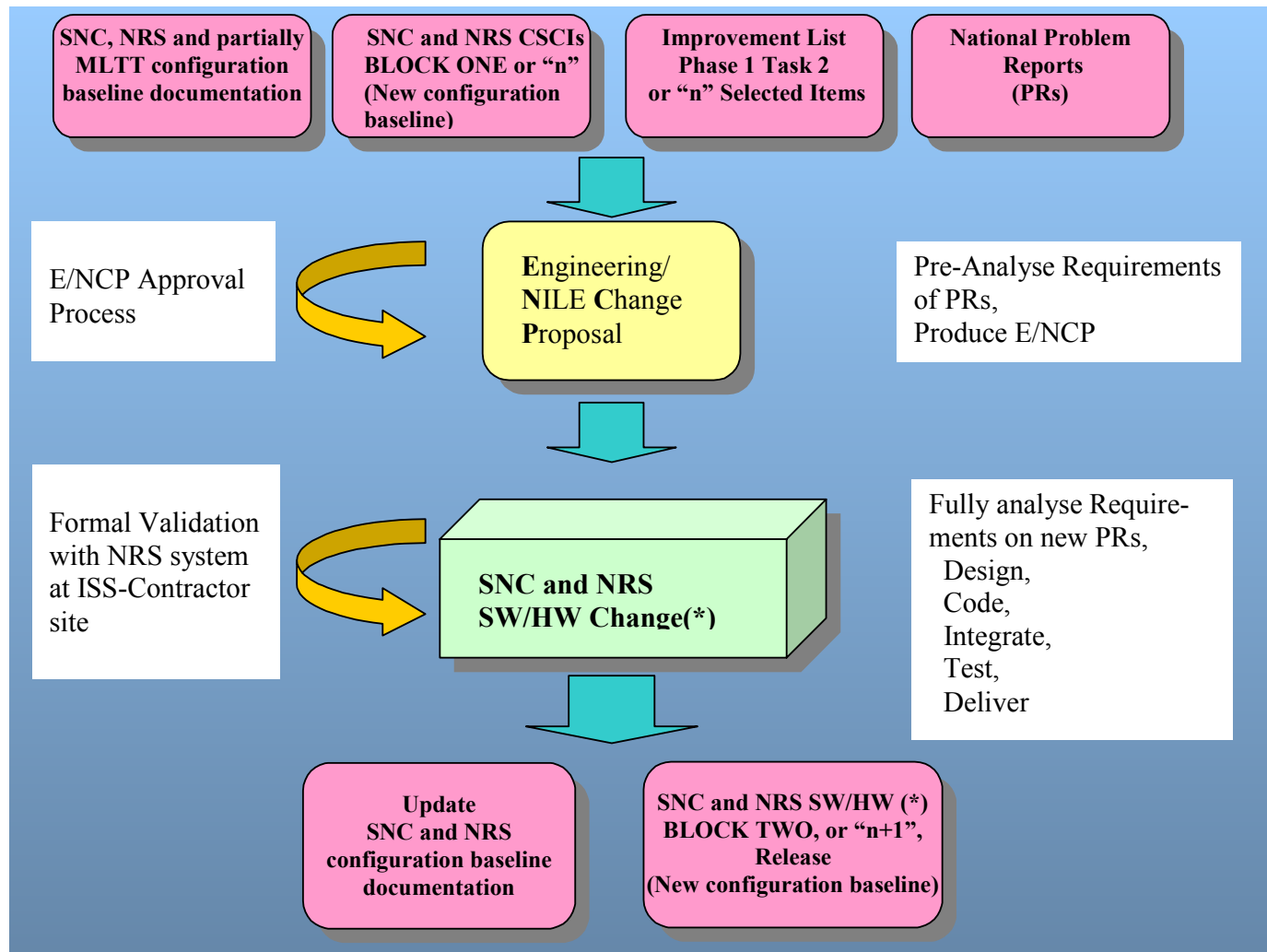
Figure 4: Software Modification Process - Phase Two (2) Task One (1) and follow-up

(*) including "modification only" of MLTT SNCd and MS CSCIs (cf to Figure 4 for details on qualification testing of these items)

APPENDIX C - MLTT SNCd AND MS SOFTWARE MODIFICATION VALIDATION

ISS-Contractor
Responsible

**\<Contractor Site\>
Modification of
MLTT SNCd
and/or MS CSCIs**

Contractor fixes
Problem(s)

MLTT- ISEA
Responsible
With ISS-
Contractor
Support

**\<Government or
MLTT-ISEA Site\>**

**Integration of
modified CSCIs
+
System Qualification
Testing**

Pass?

No

Yes

New MLTT SW
Version Release

CM of new MLTT
SW and
documentation
Version
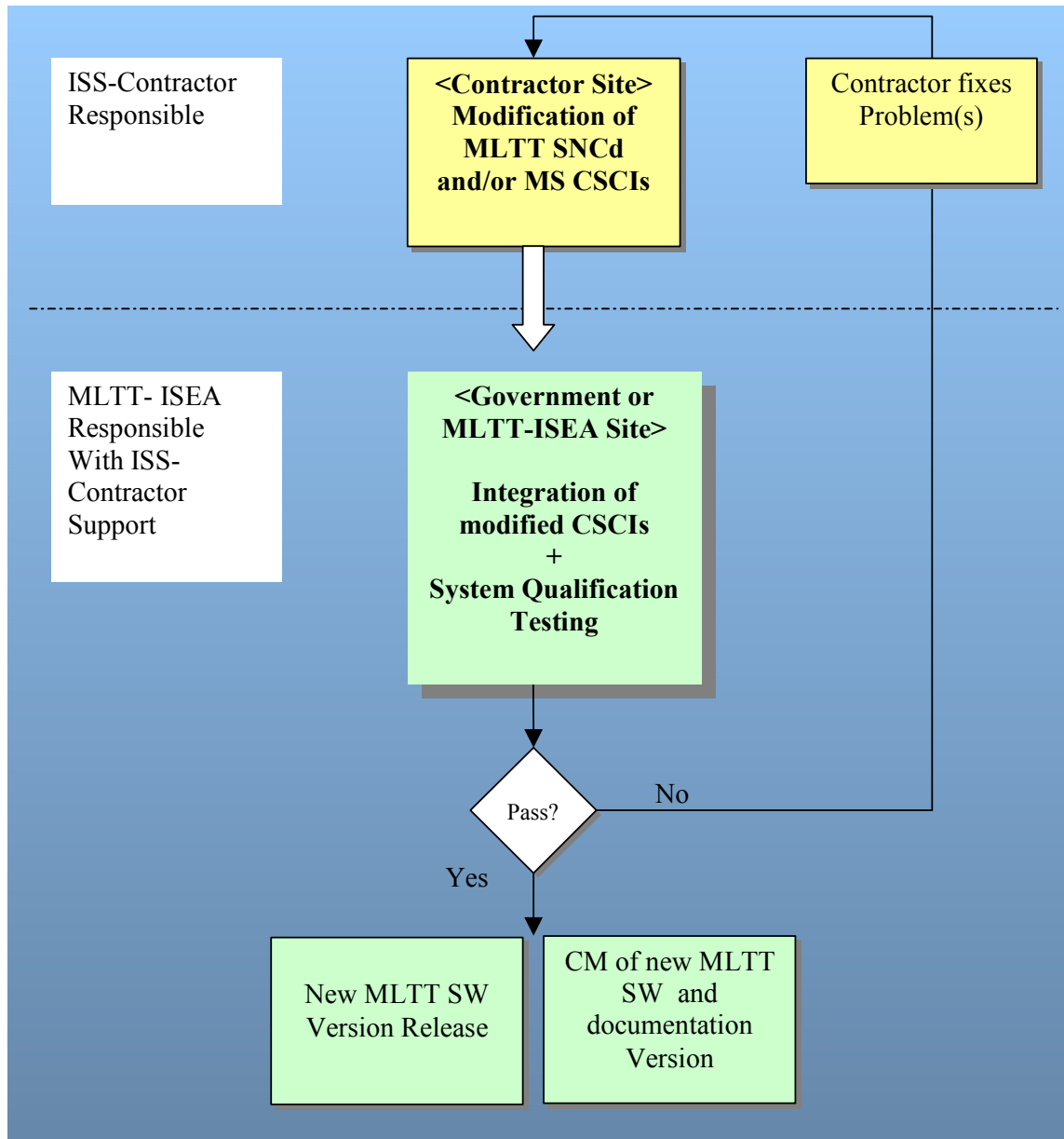
Figure 5:   MLTT SNCd and MS Software modification Validation Process

APPENDIX D - LIST OF DELIVERABLES – CONTRACT DATA REQUIREMENTS LIST (CDRL)

Keys:
P= Preliminary document / D= Draft document / R= Government Review period
F= Final document / DP= Day prior / DA= Day after
Day unit = calendar day
Axxx: General CDRLs / Bxxx: SNC CDRLs / Cxxx: NRS CDRLs

Data Item (CDRLs)	Title	SOW Reference(s)
A001	Program Management Plan (PMP)	Paragraph 5.1.2
A002	Master Schedule Of Events	Paragraph 5.1.5.1
A003	Contract Work Breakdown Structure (CWBS)	Paragraph 5.1.2
A004	Configuration Management Information System (CMIS)	Paragraph 6.3.1
A005	Request for Deviation/Waiver (RFD/RFW)	Annex B – Paragraph 1.3.6.1.4
A006	Conference agendas/minutes (IPR, DR, RR, TRR, IPT)	Paragraph 5.1.5 and sub-paragraphs
A007	Specification Change Notice (SCN)	Annex B – Paragraph 1.3.4.4
A008	Engineering Change Proposal (ECP)	Annex B – Paragraph 1.3.4.3.1
A009	Notice of Revision (NOR)	Annex B – Paragraph 1.3.4.3.1 and 1.3.6.1.3
B001	SNC Software Test Description (STD)	Paragraph 7.1d
B002	SNC Software Test Report (STR)	Paragraph 7.1e
B003	SNC Software Version Description (SVD)	Paragraph 5.2.4
B004	SNC Software Product Specification (SPS)	Paragraph 5.2.4
B005	SNC Source and Executable Software	Paragraph 5.2.4
B006	SNC Technical Data Package (TDP)	Paragraph 5.2.5

Data Item (CDRLs)	Title	SOW Reference(s)
C001	NRS Software Test Description (STD)	Paragraph 7.1d
C002	NRS Software Test Report (STR)	Paragraph 7.1e
C003	NRS Software Version Description (SVD)	Paragraph 5.2.4
C004	NRS Software Product Specification (SPS)	Paragraph 5.2.4
C005	NRS Source and Executable Software	Paragraph 5.2.4
C006	NRS Technical Data Package (TDP)	Paragraph 5.2.5

Table AppD-1:   List of Deliverables

APPENDIX E - LIST OF ACRONYMS

Acronym:	Explanation:
ARO	At Reception Of Order (Contract Award)
ATP	Acceptance Test Procedures
CAGE	Contractor and Government Entity
CDRL	Contract Data Requirements List
CLIN	Contract Line Item Number
CM	Configuration Management
CMP	Configuration Management Plan
COMSEC	Communications Security
COTS	Commercial-Off-The-Shelf
CP	Change Proposal
CPU	Central Processing Unit
CRM	Cross Reference Matrix
C&S	Control and Status
CSA	Configuration Status Accounting
CSCI	Computer Software Configuration Item
C/SSR	Cost/Schedule Status Report
CWBS	Contract Work Breakdown Structure
D&D	Design and Development
DERD	Data Extraction and Reduction Document
DID	Data Item Description
DR	Design Review
ECP	Engineering Change Proposal
ELIN	Exhibit Line Item Number
GFE	Government Furnished Equipment
GFI	Government Furnished Information
GFM	Government Furnished Material
GFP	Government Furnished Property
GPETE	General Purpose Electronic Test Equipment
HWCI	Hardware Configuration Item
IDD	Interface Design Description
ILS	Integrated Logistics Support

Acronym:	Explanation:
ILSMT	ILS Management Team
IPT	Integrated Product Team
IRS	Interface Requirement Specification
LLC	Link-Level COMSEC
MLTT	Multi-Link Test Tool
MS	Media Simulator
NCP	NILE Change Proposal
NILE	NATO Improved Link Eleven
NOR	Notice Of Revision
NRS	NILE Reference System
NRSSS	NRS System Specification
NU	NILE Unit
PHS&T	Packaging, Handling, Storage, and Transportation
PMP	Program Management Plan
PMR	Program Management Review
PR	Problem Report
PTDB	Problem Tracking Data Base
QA	Quality Assurance
R&M	Reliability and Maintainability
SCN	Specification Change Notice
SDP	Software Development Plan
SG	Scenario Generator
SNC	System Network Controller
SNCd	System Network Controller Diamond
SNCSS	SNC Segment Specification
SOW	Statement of Work
SRS	Software Requirement Specification
SR	System Requirements Review
STD	Software Test Description
TDP	Technical Data Package
TDS	Tactical Data System
WBS	Work Breakdown Structure

**APPENDIX F - GOVERNMENT FURNISHED EQUIPMENT (GFE),
         INFORMATION (GFI), PROPERTY (GFP) AND MATERIAL
         (GFM) LIST**

1   GOVERNMENT FURNISHED EQUIPMENT (GFE)

Equipment	Description
One (1) DEC Pentium II Computer	-266 MHz processor -64MB of memory. -O.S.Windows NT 4.0 with Service Pack 4 -17" Prof. 1280x1024 Monitor -Accelerated Graphics PRO2000 3D Graphics -4.3 GB SCSI Removable HD -US Kit (Keyboard, mouse, power cord, Doc.)
One (1) Hewlett-Packard (H-P) 9000 Computer	-180 MHz HP B180L processor -128 MB of memory -O.S. HPUX 10.20 -HP 4X Internal CD-ROM 1 -HP 17" Color Monitor 1 -2.1 GB Removable HD 2
One (1) SUN Ultra 5 Computer	-270 MHz processor -128 MB of memory -O.S. Solaris 2.6 -2 GB Hard Drive Internal 4x CD-ROM Sun Quad Ethernet Card

Table AppF-2:   Government Furnished Equipment (GFE)

2   GOVERNMENT FURNISHED INFORMATION (GFI)

The GFI list is composed of items specified in Annex C Paragraph 3.

3   GOVERNMENT FURNISHED PROPERTY (GFP)

Description	Nomenclature
Link Level COMSEC devices (for NRS and UUT)	LLC
Paper tape common key fill device	KOI-18, CFD
DS-101 compatible key fill device	AN/CZY-10, DTD
DS-101 adapter cable to interface LLCs with key fill device	DTD Adapter Cable
DS-101 adapter cable to interface KIV-7s with key fill device	DTD Fill Cable
Test key fill material	Test keys

Table AppF-3:   Government Furnished Property (GFP)

4   GOVERNMENT FURNISHED MATERIAL (GFM)

None

ANNEX A – WORK PACKAGE DESCRIPTION

1   PHASE One (1) – Task One (1) -Analysis, Design And Implementation

During the analysis and design stage of this task, the contractor **shall**[1] conduct, as a minimum, the following :

    a   Utilise existing scenarios with modified existing code to demonstrate effects, with corresponding feedback into the design and solution evaluation process.

    b   Demonstrate the impact of requirements, including those on other protocols, presenting "why it is better".

    c   Analysis **shall**[2] be quantitative with a defined demonstration method and shall use assessment criteria including latency, reliability, end to end delay and bandwidth utilization.

1.1.   Item 1 – Crypto Integrity Mode Implementation

The SNC, SNCd, MS and NRS (Data Extraction, Analysis and Reduction) **shall**[1] be modified to fully implement the Crypto Integrity Mode (also known as Data Integrity Verification, Data Integrity Verification Service, Network Integrity, LLC Integrity and Integrity). The modifications **shall**[2] be fully validated through the test and acceptance process.

1.1.1.   Problem Description

  1 The SNC, SNCd and MS have not fully implemented the Crypto Integrity mode. Both the SNC/SNCd and MS are able to accept the enabling and disabling of Crypto Integrity mode, as defined in the SNC SS, DLP IRS and LLC IRS. However, neither the SNC/SNCd nor MS have executed the requirement for network packets to be correctly formatted to meet the Crypto Integrity specification.

  2 To enable full support of the improved integrity of transmissions offered by the Crypto Integrity mode, within the LLC, the SNC, SNCd and MS must be modified accordingly.

    a   Amend the SNC and SNCd to shorten the data segment in each network packet that is passed to the LLC, by 16bits (2bytes), when Crypto Integrity Mode has been enabled for that particular network ID. The SNC/SNCd **shall**[1] set the data segment length to the correct value.

    b   Amend the SNC and SNCd to accept the data segment in each network packet received from the LLC, which has been shortened by 16bits (2bytes), when Crypto Integrity Mode has been enabled for that particular network ID.

    c   Amend the MS to accept the network packets from the SNC/SNCd, which are short of the standard NP size for the configured MSN, by 16bits (2bytes), when Crypto Integrity has been enabled for that particular network ID.

Determination of whether the MS is required to add 16bits (2 bytes) to the data segment to "pad" the NP **shall**[1] be made during analysis and design of the modification.

d   Amend the MS to enable the introduction of Crypto Integrity errors, as defined in the LLC IRS.

e   Amend, if necessary, the SNC/SNCd to implement "shalls" (1) and (2) of SNC SS Paragraph 3.1.3.3.12.2.

f   Add applicable "shall" requirements to the SNC SS and SNC SRS.

g   Amend as necessary the NRS Data Extraction, Reduction and Analysis NRS CSCI modules to extend the existing capabilities to support the SNC, SNCd and MS amendment.

h   Add, if required, applicable "shall" requirements to the NRS SS, MS SRS and SG SRS.

NOTE: This Item should be coordinated with Item 3 b) to ensure alignment with the extension of the LNE Media Parameter Acquisition Algorithm.

1.2.   Item 2 – Guaranteed Delivery and Related Service Header Amendments

The purpose of this Item is to review and amend the Guaranteed Delivery (GD) protocols to fully support GD on multiple, concurrent NILE Networks (NN), removal/reduction of the minimum period between multiple NN transmissions, amend the associated MP Age field within Service Header 3 and reduce the MP Age field within the GD Ack CSM. The SNC and SNCd **shall**[1] be modified and validated through the test and acceptance process.

1.2.1. Problem Description

1   The SNC Guaranteed Delivery (GD)/Leg Acknowledgement Delivery (LAD) protocol does not currently support multiple concurrent networks. The existing rules limit the number of re-transmissions to meet the required reliability to 3. However, the SNC can be connected to up to 4 NNs, each of which may have an intended GD destination, thus the re-transmission limitation restricts access to all intended destinations. The efficiency of possible solutions is required to be considered to reduce any waste of transmission bandwidth. Possible solutions could include number of re-transmissions multiplied by the number of NNs of intended destinations or the first transmission on a NN counts as the first total number of transmissions, regardless of the number of NNs. Furthermore, a limitation exists within the SNC SS, 3.1.2.3.4.7.8 ("shall[3]"), that restricts the minimum time between transmissions on multi-networks to 5 seconds, which can cause timeslots to be missed. Removal or reduction of this limitation should be implemented. In parallel, the size and operation of the MP Age within Service Header 3 is required to be amended to function the same as Service Headers 4 and 5, dynamic sizing. Also, the GD Ack CSM is required to be amended to reduce the size of its MP Age field to 8 bits.

₂   During the analysis activity, the service header usage for non-MR Totalcast transmissions should also be reviewed, to determine any need to include a non-MR addressee group.

₃   Additionally, as Service Headers are being modified then the removal of the UAD field bit and corresponding group should be undertaken. Removal is required as the operational community has identified no use, particularly in support of data forwarding, removal will save a single bit in Service Headers 1, 3 and 5. Impact would be on RTS scenarios used during sub-phase 2 acceptance, which require analysis of modifications to enable the same test functionality to be implemented in other scenarios (duplicate detection test scenarios are impacted).

₄   Furthermore, amendment, as necessary, of the NRS Data Extraction, Reduction and Analysis NRS CSCI modules to support the revised Service Header and CSMs is required.

1.3.   Item 3 – Late Network Entry (LNE) and Late Traffic Entry (LTE) Modifications

The purpose of this Item is to amend the current LNE and LTE procedures to improve efficiency, add functionality and enhance the existing specification. The SNC and SNCd **shall**[1] be modified and validated through the test and acceptance process.

1.3.1.   Problem Description

a   The current LNE and LTE functionality specification places restrictions on the efficiency of the capability. An example is that a unit which is already active upon one network and wishes to join another (LTE), is required to conduct the LNE procedure, once it has obtained the Media and ONCS parameters from the requested NMU. This is a time consuming approach and requires the insertion of an LNE time-slot. A more efficient approach would be to obtain all of the necessary network and media parameter information through its active network(s) and make the requests to join and obtain capacity through its active network(s). Responses to the LTE units requests will be received through its active network(s). If granted permission the LTE unit will join through a either a network re-configuration or re-initialization; if an LNE unit is not granted permission on the requested network, it will be supplied with all of the necessary media and network parameters of the network it was granted permission upon, as part of the "Fail" response.

b   The current LNE protocol limits the media fragmentation rates available to the network design, when LNE is expected, this problem is exacerbated by the current Crypto Integrity restriction. If Crypto Integrity mode is not enabled then the SNC can only conduct the media acquisition with, for applicable Media Types, Media Fragmentation Rate (MFR) set to 1. This restriction is to be removed, such that all available MFRs are utilized in the Parameter

Acquisition Algorithm and the applicable SNC SS requirements amended. Furthermore, the received NP process should not discard received NPs, if Crypto Integrity is disabled. NOTE: It is believed that the current SNC behaves in the manner required and described above, however the SNC SS is out of alignment. This should be validated before assuming that the code meets the required solution.

c   Silent Join LNE (SJLNE) functionality is required to be implemented. SJLNE allows a unit to become a pseudo receive only member of the NN, by acquiring the media and ONCS parameters and thus receiving NPs from the other NUs, without making an active transmission. The SJLNE NU will not be seen within the NN and will not actively participate in network management activities, however if it receives reconfiguration or re-initialization information it will be able implement the resultant. A possible solution may be to stop the active join LNE process once the Media and ONCS has been obtained, thus allowing the SJLNE unit to pass the tactical traffic it receives to its DLP. Amendment of the DLP-SNC interface will be required to reflect any upgraded function instruction and completion indication.

d   ONCS Convergence, i.e. obtaining the complete ONCS by listening to the received pre-ambles once the media has been acquired, requires improving, as in some instances the ONCS is not gathered. Review of existing internal design parameters and protocols and removing prohibitive specification restrictions is required, possible solutions may involve changing the requests with the time-slot size from maximum time slot to a lesser value, thus acquiring more pre-ambles. The efficiency and probability of completion of the ONCS convergence of a full LNE/SJLNE unit should be improved. This sub-Item should be combined with Item 4, where modification to the way an ONCS computed may be able to set rules to aid convergence.

e   The SNC SS 3.1.3.3.7.4.1 and 3.1.3.3.7.4.12 requires review and correction to align with other published definitions of conducting LNE, LTE and Late Initialization. The exact operation of the SNC under each of the conditions identified and the 3 values available in the DLP-SNC Interface "Network Late Initialization Request" should be examined and then discussed with the PMO to determine the exact configuration of a solution to reduce any potential confusion. Furthermore, the exact type and sequence of technical messages to be transmitted by the LNE/LTE NU is to be optimized to take advantage of information already held by the SNC. Specifically for a Late Initialization NU an SN Directory Alignment Request is to be added to be sent immediately access is gained to the NN by the SNC.

f   SNC SS 3.1.3.3.7.3.7, sub-paragraph 2, **shall**[9] sub-sub-paragraph, states that the SNC is required to utilize the error messages sent by the SPC when conducting parameter acquisition on media type UHF EPM. However, it has been determined that the error messages do not provide the SNC with enough

information to determine the whether the correct media setting values have been found. The Item is to review the available information within the UHF EPM SPC Specification/STANAG 4372 to determine what additional information, beyond EDAC successes, will allow the SNC to acquire the UHF EPM media characteristics and propose the necessary changes to the SNC and associated documentation.

The above Item impacts the complete NRS, which is required to be modified accordingly to maintain existing capabilities. Where the DLP-SNC interface is amended the most efficient and effective solution is required, specifically when addressing a) and c) above.

1.4.   Item 4 – TSR Handling Modifications

The purpose of this Item is to analyze and implement the necessary modifications in the TSR handling interface between the DLP and SNC, to enable the DLP to more accurately determine periodic and significant change message updates and meet priority rules. Additionally, the SNCd TSR restriction in place on the NRS requires review against current SNC platform performance capabilities. The SNC and SNCd **shall**[1] be modified and validated through the test and acceptance process.

1.4.1. Problem Description

a   The TSR Complete message from the SNC does not provide complete information to the DLP. Missing information includes the time of initial transmission, percentage of units reached in the transmissions and whether any transmissions at all were made. The TSR Complete message is also sent regardless of whether all transmissions were made or any at all. As a minimum the actual transmission time of the first response to a SNC's MPR for a tactical message is to be included in the Transmission Complete message to the DLP, to allow it to accurately determine "significant change" periods
Analysis of the information necessary for a DLP to make decisions on tactical message transmissions is required, together with considerations for Transmission Time-out values between the DLP and SNC and automatic cancellation of TSRs.

b   Currently the SRIDs that are sent in Message Preparation Requests (MPR) to the DLP are not in Priority order. The order is based on the network packet-packing scheme that is calculated before requesting the tactical messages from the DLP. It is therefore possible for a high priority message to be requested after several messages of lower priority, purely as a result of where the data fits in a network packet. If the DLP cannot respond with all of data within the MPT, it may only send the data for the less important messages. To avoid this problem, it may be better to add a requirement to ensure that the SNC orders

the SRIDs by priority to guarantee transmission of the highest priority messages first. Review of potential SNC solutions is required.

c   The NRS System Specification SCCI/SP/NRS/4.3, Paragraph 3.2.1.1.1.1.2.2.1.3 places a restriction on TSR provision to the SNC and SNCd NUs of 50 TSRs per second. This restriction should be reviewed against current SNCd platform performance capabilities to determine a more appropriate figure, which can be translated to a DLP requirement.

No changes are expected to the NRS, as this should be a totally internal change to the SNC/SNCd for a) and b), however c) may require a change.

1.5.   Item 5 – DLP-SNC Interface Modifications

The purpose of this Item is to analyze and implement the necessary modifications in the interface between the DLP and SNC to provide the DLP with a more complete communication of commands and statuses. All modifications **shall**[1] be validated through the test and acceptance process.

1.5.1. Problem Description

a   The introduction of a code to explicitly state the turning off of Forced LRQ (for a Receive Only/Radio Silent NU) is required, as currently it relies upon a default of (0,0). A suggested code from available bits is required, prior to implementation.

b   The interface between the DLP and SNC requires analysis of the current messages and codes that communicate failure or inability to proceed, to determine the necessary improvements. The reason for rejection of TSRs, in the DLP/SNC – IDD do not fully communicate the reason for rejection. This is especially true for a NN or SN Closedown. The reason for rejection for Link 22 Address allocation request, in the DLP/SNC – IDD does not fully describe the reason for rejection. Extend the SNC-DLP interface to include additional error codes for LLC failures or no responses. The C&S Message 806h requires extending to address non alarm messages, i.e. configuration no responses. The SNC Cantco responses require analyzing across the DLP-SNC I/F, including GD non-MR Addressees, CANTCO/Error Codes.

c   A Link 22 Forwarding NILE Unit is not supported within the SNC. All occurrences of FNU, within the SNC and DLP-SNC interface specifications should be identified and removed and any corresponding changes to the SNC conducted to remove or "comment out" this parameter.

Any change to the DLP-SNC interface impacts the NRS. Applicable modules will require modification.

1.6.   Item 6 – SNC – LLC Interface Modifications

The purpose of this Item is to review the existing capability, identify modifications and modify the SNC-LLC interface, including BIT tests, post NU Initialization LLC Port Configuration and post NU Initialization Key-Rollover Synchronization. The modifications **shall[(1)]** be validated through the test and acceptance process.

1.6.1. Problem Description

[1] SNC-LLC interface needs modification to either add a BIT (Built In Test) status message from the LLC or ensure that the SNC polls the LLC following an LLC failure. This would allow an automatic restart of the interface. Both the LLC and SNC would require modification. Also, the SNC is unable to accept a post NU Initialization LLC Port Configuration message from the DLP without causing all existing LLC and Port information to be reconfigured as well, with consequential shutdown of the NU on all networks (the current SNC may operate acceptably, but requires validation). Furthermore, the SNC is unable to accept, post NU Initialization, a Key-Rollover Synchronization message from the DLP without causing all existing LLC Key information to be rolled over as well, with consequential shutdown of the NU on all networks. Solutions to all of the above are required to be determined, identifying any necessary LLC amendments. The analysis should address what is currently possible, before progressing with any of the above detailed actions.

[2] Any change, which alters the message structure of the SNC-LLC interface, will require modification of the NRS MS, DX, DR and DA.

1.7.   Item 7 – Correction of Identified Problem Change Reports (PCRs) and Any Additional Problem Reports

The purpose of this Item is to cover the analysis and correction of individual existing PCRs and those raised from the MLTT development work, the conduct of the modifications necessary to support the above Items and any identified from national implementation.

1.7.1. Problem Description

[1] Problem Change Reports have been raised on the SNC/SNCd as an output from modifications in support of MLTT (PCRs 179,180 and 181) and it is expected that there may be PCRs raised as a result of modifications conducted as a result of the Items described within this Annex Section 1. PCRs raised as a result of the modification Items will be reviewed to ensure they are not part of the change, but existing defects in other code areas that have been uncovered by the modification.

[2] Problem change reports which are extant from the Sub-Phase 2 development work may require analysis and correction. The specific PCR identified at this point is PCR 58.

₃   Nations conducting an implementation of the SNC may also identify problems, which will also require analysis and correction. The number of defects expected has been estimated as 10/year.

₄   There may be corresponding NRS CSCI modifications as a result of the correction of PCRs.

1.8.   Item 8 – Network Membership And Radio Power Communication

The purpose of this Item is to implement NILE Network membership communication and correct the SNC technical re-initialization message. The SNC and SNCd **shall**[1] be modified and validated through the test and acceptance process.

1.8.1. Problem Description

₁   NN membership communication: - The DLP is provided with the SNC's view of NN membership, for those NN it is a member. This is achieved through LCD and LRQ messages, only within 3 legs and only for active units. DLPs are aware of OLM NN membership, but this is only implicitly supplied to the SNC through ONCS initialization messages and may exclude Receive Only NUs. The SNC does not need to know who is in a specific NN, even when it is an NMU or Standby NMU. In this case it is the responsibility of the DLP to control re-configurations etc. DLPs of the SNMU, NMU and Standbys are informed of the presence of NUs and NN membership through NU Performance messages. However the other DLPs are not aware of the specific NN membership from these NU Performance messages. Determination of whether a new NN membership message should be added at a Tactical or Technical level to communicate NN membership, especially after LNE, is required. Furthermore, the communication by the SNC to DLP in the 602h and 607h C&S messages of only the network information for which it is a member requires amendment to communicate all known Link Reception Quality and Connectivity information, regardless of whether the SNC is a member of that NN."

₂   The addition of "radio power" to the technical network re-initialization network management messages, to allow the dynamic radio power control, and the corresponding DLP to SNC C&S messages is required. The DLP has the ability to instruct a change in "radio power" to the SNC, which the SNC is able to communicate to the SPC. The DLP of the SNMU or NMU ordering a network re-initialization must be able to communicate the required "radio power". Furthermore the DLP of an SNMU or NMU may require the ability to instruct a network or individual NU to increase or reduce "radio power".

₃

₄   The addition or modification of existing DLP-SNC or SNC technical messages will cause a corresponding impact upon the appropriate NRS modules (SG, DR, DX, DA etc.).

1.9.   Item 9 -Data Forwarding Data Originator Modification

The purpose of this Item is to implement the data originator modification to the SNC/SNCd to correctly reflect both the NILE and originator data source for forwarded messages. The SNC and SNCd **shall**[1] be modified and validated through the test and acceptance process.

1.9.1.   Problem Description

₁   As the "true" data originator is not communicated within each J series message, there is a need to extend the SNC service headers to provide the communication of this information. The following initial analysis of the required modification is provided and should be reviewed and any additional analysis conducted, to determine the best design solution.

₂   Data Originator naming conventions to support Data Forwarding require definition and subsequently the Service Headers and the CT Data Originator Identification area of the specification require amendment. Proposed changes to the SNC SS are:

a   Delete the current definition of Data Originator, replace with either of two new, where applicable:
-NILE Originator:- The originator of the data transmission into the SN.
-Data Source:- The actual originator of the data, which may not be a Link 22 NU, applicable to Data Forwarding.

-Paragraphs 3.1.2.3.4.3 – Rewrite this set of paragraphs to reflect below.

-Paragraph A 1.2 b) Change to read as "Data Source Group: to support…".

b   Amend Table I of Appendix A as follows:
 Insert new line:- "Data Forwarding" with Service Header Data Items/Group "Data Source Group" and under Service Header Number 1 = "E", 3= "E" and 4= "E", all other Service Header Numbers left blank.
-Delete Data Originator Identification line.
-Insert new line: "NILE Originator Identification" with Service Header Data Items/Group blank and under Service Header Numbers 1 to 3 = "I", 4 and 5 = "E" and 0 = blank.

-Paragraph A 2.2 e) Change to read as "Data Forwarding Flag: of size…".
-Paragraph A 2.2 f) Change to read as "Data Source Group: which …".
-Paragraph A 2.4 I) Change to read as "Data Forwarding Flag: of size…".

-Paragraph A 2.4 j) Change to read as "Data Source Group: which …".
-Paragraph A 2.5 I) Change to read as "NILE Originator Address: of size 7 bits.".
-Paragraph A 2.6 I) Change to read as "NILE Originator Address: of size 7 bits.".
-Paragraph A 2.6, new n) Same as A 2.2 e).
-Paragraph A 2.6, new o) Same as A 2.2 f).
-Paragraph A 3.2 Change to read as "Data Source Group: The Data Source Group is defined to consist of the following data items in the order listed:

1. Link 22 Address Flag: of size 1 Bit which **shall**[1] be assigned equal to value 1 when a 15 bit Link 22 Address is included as the Data Source Address, other wise assigned equal to a value 0.
2. Data Source Address: of size 15 bits when the Link 22 Address Flag is 1, otherwise of size 7 bits."

-Paragraph 3.2.1.2.4 – Rewrite this paragraph, as required, to reflect the above.

c. Add new definitions to Glossary.

3   The addition or modification of existing SNC service headers will cause a corresponding impact upon the appropriate NRS modules (DR, DX, DA etc.).

1.10. Item 10 – NRS Time Of Day Source Amendment

The purpose of this Item is to amend the NRS to change the current reliance upon the Brandywine Time Of Day cards. The NRS and its sub-components **shall**[1] be modified remove the need for a Brandywine ToD card, through the amendment of the ToD acquisition and distribution system.

1.10.1.   Problem Description

1   The current NRS ToD acquisition and distribution system for the Intel platforms is dependent upon the Brandywine ToD card suite. Analysis and recommendation of an alternative source and distribution system is required, which still meets the accuracy requirements of the existing Data Extractor and SNC/SNCd systems. Alternative hardware or LAN time distribution systems are to be considered, to identify the most flexible and cost effective solution.

2   As part of the above analysis, the possibility of porting the NRS CSCIs to a single computer solution to operate in System Simulation mode only, with a reduced SNCd capability of 32 NUs should be conducted. The ability to operate the NRS on a single machine would allow scenario development and validation on local machines and would free up the NRS hardware. Implementation of a single computer NRS will be determined at the SR.

2   PHASE One (1) – Task Two (2) – Analysis and Recommendation

During the analysis and design stage of this task, the contractor **shall**[1] conduct, as a minimum, the following :

a   Utilize existing scenarios with modified existing code to demonstrate effects, with corresponding feedback into the design and solution evaluation process.

b   Demonstrate the impact of requirements, including those on other protocols, presenting "why it is better".

c   Analysis **shall**[2] be quantitative with a defined demonstration method and **shall**[3] use assessment criteria including latency, reliability, end to end delay and bandwidth utilization.

2.1.   Item 11 – Operational Network Cycle Structure (ONCS) Computation By The SNC and DLP

The purpose of this Item is to analyze and recommend amendments to the current ONCS computation by the SNC to improve it and to produce an optimized computation algorithm for use by all DLPs.

2.1.1   Problem Description

1   The current SNC computation of an ONCS is required to be analyzed and modified to improve its performance and implementation. The current implementation is unable to produce a result for a NN containing 125 NUs, does not take into account the relay setting of an NU (unless after a probing initialization) and does not automatically insert an Interrupt Slot.

2   The analysis should as a minimum, examine: the granularity of the CN and AD values, possibly allowing more than 2 bits of data to convey longer and larger values; the inclusion of relay setting values in the allocation of capacity; the extension of the parameters used in computing the ONCS to include other settings and status values than CN and AD; determining a maximum time the SNC has to compute an ONCS; prioritization of ONCS computation parameters; and the ability to compute a ONCS for a 125NUs (even applying a simplified allocation, e.g. default slot size related to media fragmentation rate); the ONCS computation algorithm **shall**[1] be deterministic. Furthermore, the ONCS computation algorithm should be amended to, by default, insert a number of Interrupt transmission slot into an ONCS, regardless of whether CN and AD values have already been met, providing access to percentage of NU's, i.e. 25%. The position of Interrupt Transmission Slots should be analyzed for efficiency and effectiveness.

3   The DLP requires a generic algorithm to be defined that allows it to compute an ONCS in a number of situations, initialization, reconfiguration and re-initialization. The algorithm is required to take into account as much of the NN/SN information that the

DLP retains to produce the most effective and efficient ONCS design. Information, which can be utilized, would include, but not be limited to, connectivity expectations, data forwarder responsibilities, relayer status and NU track contribution capability. Furthermore the DLP is responsible for approving an SNC computed NCS, the mechanism of how a DLP determines that the SNC's ONCS is acceptable requires analysis, an example would include capacity and access thresholds. If a DLP determines that the computed ONCS does not meet the "requirements" it must have a way of vary the parameters supplied to the SNC to enable the SNC to produce a different result, if it requested to re-compute. Analysis and presentation of recommended solutions are required, which may include do nothing and do the same (SNC and DLP) recommendations.

4   The NRS may require amendment if there is any change in the information crossing the DLP-SNC Interface, i.e. CN and AD values and or additional fields are added to provide the SNC with more information with which it computes an ONCS.

2.2.   Item 12 – Fragmentation and Network Packing Rules Analysis and Modification

The purpose of this Item is to conduct a full analysis of the current specification rules for Network Packet Packing (NPP) and Network Packet Fragmentation, to identify and recommend modifications in efficiency and operation.

2.2.1. Problem Description

1   The current SNC SS specifically stops the SNC from conducting both Leg and Continuation Fragmentation on the same Message Packet (MP), a fragmented MP cannot be further fragmented. This provides a potential limitation when attempting to transmit a tactical message containing 8 TMW in a minimum time-slot size (4(3) MS) on an HF FF NN with MSN and Fragmentation Rate of 1. As the time slot is too small to Continuation Fragment the complete MP, Leg Fragmentation is required. Leg Fragmentation has significant service header overheads which "wastes" bandwidth.

2   The current SNC SS rules on NPP limit adaptation to amend according to the ratio of NP to MP size. At present if the NP is consistently bigger than MP requirements the rules function well, however if the size of a NP is smaller than the MPs it has to pack, a different set of rules are required to achieve the same efficiency. An example is to allow small MPs to be grouped together in a NP rather than being spread across multiple NPs, reducing the size of the resulting NPs and causing the requirement for Leg Fragmentation, rather than Continuation Fragmentation for subsequent large MPs. Consideration should be given to incorporating a stop point for scanning down the pending TSRs for packing, i.e. if a certain percentage of the NP has been filled. The analysis of the rule set should include including the requirement to provide space for technical messages.

3   The impact on bandwidth efficiency of amending the fragmentation rules to allowing a fragmented MP to be further fragmented or continuation fragmentation to be allowed across multiple timeslots is required to be analyzed; as are the NPP rules to determine the benefit against the effort to make the necessary amendments to the SNC/SNCd (and NRS Data Extraction and Data Analysis). As a minimum the aspects to be addressed in the analysis will include the effect on the reliability computation, managing the size of MPs requiring relay and any impact on associated service headers and functions (e.g. duplicate detection methods).

4   An overall feasibility review of whether it is practical and beneficial to include a look ahead at the delivery path of a MP before determining the NP and fragmentation scheme may be conducted. This could overcome difficulties with a MP originally packed in a UHF NN that is required to be relayed to a HF NN, in which the relayer is not allowed to further fragment the MP and thus the MP may never reach its destination.

5   Any change to the fragmentation rules, may have an impact on the NRS Data Extraction module, which would modification accordingly.

2.3.   Item 13 - DTDMA Modifications

The purpose of this Item is to conduct a full analysis of the DTDMA functionality and specification, following its initial implementation, to determine and propose possible modifications.

2.3.1. Problem Description

1   The DTDMA functionality within the SNC requires analysis and possibly modification to improve the performance of the current design and implementation.

2   The analysis should, as a minimum, examine: ability of a donor to make an offer different from that requested, i.e. a permanent offer to a temporary request, and the acceptance by the recipient of an offer of a type different from that requested; consider the efficiency of conducting temporary allocation of capacity, including the bandwidth and time taken to set up the reallocation of slots against the benefit of permanently allocating the capacity; the benefits of extending the period of temporary allocations.

3   Furthermore, the action of an NU participating in a Temporary Allocation of capacity, when DTDMA is Disabled is not clear. The action of an NU requires analysis and definition, i.e. wait for the DTDMA Disable ToD then cease use of slots, as if the End of Re-Allocation had been met.

4   No NRS modifications are foreseen, as this should be a fully internal SNC/SNCd amendment.

2.4.   Item 14 – Duplicate Detection Modification Analysis

The purpose of this Item is to analyze the existing duplicate detection specification and implementation to determine solutions to existing problems and identify modifications in its operation.

2.4.1. Problem Description

a   When an RPRNU has a neighbor RPRNU and receives a last leg relay message with Service Header 4 or 5 (non-MR address group empty), the content is stored and tactical information passed to the DLP. If a subsequent MP is received with a SH 4 or 5, in which the address group is not empty, i.e. it requires relay by that NU, duplicate detection informs RRM of the duplicate but does not pass it enough information for it to schedule the relay. Thus the MP will not be relayed by the NU to the required destination. Possible solutions are: Solution 1. Change duplicate detection to store address group information for SH 4 and 5 received MPs. If another MP with identical MTV, source, DUCC and SH 4 or 5 but address group not empty, pass that to RRM. Possible drawback is that the number of duplicate relay transmissions may increase above the current limit of 2 in 1000 and the sizing of memory and cost of processing may increase.
Solution 2. All SH 4 and 5 MPs are passed to RRM, even if last leg. Where applicable the MP will be marked as a duplicate. RRM makes the comparison of address groups to determine the need for next leg relay. This is effectively a secondary duplicate detection and will require expiration times to be defined. Drawback is again memory sizing and processor costs. Analysis of all available solution is required.

b   Duplicate detection may require further criteria to be specified beyond E2ERN, MTV and Originator. Currently the design also includes Message Packet (MP) comparison and may require specific rules for Relay duplicate detection to tidy up the issues identified above, with broadcast and subsequent relay receptions. Analysis of modifications in utilized message criteria is required, which should include considering duplicate detection of messages rather than MPs

c   The current duplicate detection function applies detection rules, where the initial receipt of a Machine Receipt (MR) message/MP, followed by a duplicate non-MR correctly detects the non-MR as a duplicate, however the reverse is not detected, which should be confirmed and corrected.

d   The wording of the duplicate detection performance, Section 3.2, is based upon messages, where the duplicate detection field criteria are based upon MPs. Possible future change of words for the SNC SS 3.2. Review of modifications in the specification wording is required.

No NRS modification is foreseen, as this should be a fully internal SNC/SNCd amendment.

2.5.   Item 15 – Standby Takeover Timing and Connectivity Loss Modifications

The purpose of this Item is to analyze and determine modifications to the method of identifying the loss of connectivity to a NU and to identify methods of allowing the DLP to vary the time of takeover of a Standby management unit.

2.5.1. Problem Description

1   The ability to control the time of takeover by a Standby, through the DLP interface should be analyzed. The difficulties with an automatic calculation by the SNC, using distance has highlighted the need for an alternative method. The DLP would be able to change the value depending on connectivity, geographical separation and importance of a swift takeover. See STR S277 and response from SNC team for details.

2   A more effective method of detecting loss connectivity requires analysis and recommendation. This is to overcome the problems with connectivity decay, should the actual status of an NU not be communicated promptly. It could take up to 10 minutes plus a further 3 NCTs before the loss of connectivity is known. Tactical and technical messages should be considered.

3   The addition or modification of existing DLP-SNC or SNC technical messages will cause a corresponding impact upon the appropriate NRS modules (SG, DR, DX, DA etc.).

2.6.   Item 16 – Super Network Directory Update Modifications

The purpose of this Item is to analyze and determine potential modifications to the method of supplying SN Directory alignment updates to reduce wasted bandwidth and the potential for confusion.

2.6.1. Problem Description

1   It has been highlighted during the SNC SQT Scenario development, that significant bandwidth can be taken up through erroneous SN Directory alignment requests, caused by concurrent requests for re-alignment. The situation has been highlighted following a roll over of an element within the SN Directory, in which the response to a re-alignment request from an LNE unit and when a neighbor NU concurrently requests a re-alignment from the SNMU. A similar problem has been previous analyzed, as part of ECP1A Item 2, and thus potential solutions are known, including responding to a SN Directory realignment request with the current status of the SN Directory, rather than all changes to the current version. The erroneous requests cause a significant increase in bandwidth above the 10% technical traffic load and may seriously degrade the performance of the L22 system. Also, analysis of whether any unit which joins after OST, i.e. a Late Initialization NU, automatically requests a SN Directory realignment, is required.

₂   No NRS modifications are foreseen, as this should be an internal SNC/SNCd change, with no interface modifications.

2.7.   Item 17 – TSR Routing

The purpose of this Item is to examine the potential solutions to reducing nugatory relay transmissions due to current implementation restrictions.

2.7.1.   Problem Description

₁   It has been identified that situations may exist where additional relay transmissions are made to non-relevant addressees. This, it is understood, is due to a limitation in CT, in that it is unable to accept different addressing types for each network. A temporary solution has been implemented, but a more complete solution requires analysis to save SH bandwidth usage and reduce nugatory transmissions. A single TSR may require up to 4 different delivery requirements. The analysis should firstly identify what happens at present and how often there is a problem, then examine the viability of solutions, including the ability to differentiate MR and non-MR delivery requirements and address the duplicate detection impact. PCR 70130 provides additional information.

₂   No NRS modifications are foreseen, as this should be a fully internal SNC/SNCd amendment.

2.8.   Item 18 – System Investigations

The purpose of this Item is to conduct the analysis of Link 22 system type items that have been identified as possibly requiring correction within the SNC and other components. Potential solutions are required to be identified with any trade offs and related impacts.

2.8.1.   Problem Description

₁   SNC-SPC Processing Time Optimization - The SNC implementation and specification require improving, with regard to the SNC processing time, that is currently more than current technology allows. A refinement of the requirement and a flexible implementation is suggested, after addressing the overall system timing breakdown. Currently SNC_Default (1 sec) + DLP_MTP + SPC_Proc. In the SNC SS "3.2.1.2.16.7 Network Packet Production Timing: A SNC **shall**[1] have the capability to vary the NP Production Time required by the SNC segment to accommodate the constraints imposed by the attached DLP and Media Segments, and associated interfaces. A minimum adjustment range of 0 to 1000 milliseconds in 50 millisecond increments **shall**[2] be provided". Analysis should also address the need for an SPC Receive Processing time from the SPC to "tune" the SNC.

2   DLP Operator Statistical Information Requirement - The SNC is able to provide a significant of information to the DLP and subsequently the Operator on, both individual message overall system performance. Analysis of the available information, its need and use by both the operator, DLP and L22 System as a whole is required. What does the operator need to see, how often and what can they do about it? What automatic functions does the DLP need to undertake if the SNC presents various statistical information sets?

3   Tactical NU Performance Message Usage and Contents - The information in the NU Performance tactical message does not match the information provided by the SNC to the DLP. The NU Performance message is used not only to report current system performance, but also as a heartbeat for status determination. The periodic distribution is considered to be inefficient and the fact that PLI messages are required to be transmitted periodically brings the purpose into question. Analysis will address the need for and purpose of performance information within the SN and the need for periodic or on change/request distribution at the tactical level. Furthermore, analysis of the use of existing tactical and technical messages to conduct the same function is required.

2.9.   Item 19 – Core Documentation Tidy Up

The purpose of this Item is to remove the ambiguities, duplicate terms and inconsistencies within the "core" Link 22 specification documentation set.

2.9.1. Problem Description

1   The current documentation set, identified as "core" in Appendix A to Annex B contains numerous ambiguous terms, contradictory statements and inconsistent terminology. This situation has led to un-implemented functionality and confusion, examples include Crypto Integrity Mode, DIV etc. Issues Data Base Item 224 provides further items for correction.

2   Correction of these inconsistencies is required to be conducted to produce an easy to understand final specification documentation set.

3   This Item should be, where possible, conducted in conjunction with the other documentation updates

2.10.   Item 20 – SNC and NRS Operating System Migration

The purpose of this item is to conduct an evaluation of the impact of migrating from the existing Windows NT 4.0 Operating System to Windows XP.

2.10.1.   Problem Description

1   The Intel platform SNC and NRS platforms were developed to operate within the Windows NT operating environment. Windows NT is in the process of being replaced by Windows XP and how long Windows NT will be supported is being questioned. To

prepare for the future an evaluation of whether, when and the impact of doing so is required for migrating the SNC and NRS Intel platforms to Windows XP operating system.

3   PHASE Two (2) – Task One (1) -Implementation

During the analysis and design stage of this task, the contractor **shall**[1] conduct, as a minimum, the following :
   a   Utilize existing scenarios with modified existing code to demonstrate effects, with corresponding feedback into the design and solution evaluation process.
   b   Demonstrate the impact of requirements, including those on other protocols, presenting "why it is better".
   c   Analysis **shall**[2] be quantitative with a defined demonstration method and **shall**[3] use assessment criteria including latency, reliability, end to end delay and bandwidth utilization.

3.1.   Items 11 to 18 and 20 of Phase One

Implementation of the recommended solutions determined during Phase 1.

3.2.   Item 1 – Correction of Problem Change Reports (PCRs) and Any Additional Problem Reports

The purpose of this Item is to cover the analysis and correction of PCRs which may be raised from the MLTT development work, the conduct of the modifications necessary to support the above Items and any identified from national implementation.

3.2.1. Problem Description

1   Problem Change Reports may be raised as an output from modifications in support of MLTT and it is expected that there may be PCRs raised as a result of modifications conducted as a result of the Items described above. PCRs raised as a result of the modification Items will be reviewed to ensure they are not part of the change, but existing defects in other code areas that have been uncovered by the modification.

2   Nations conducting an implementation of the SNC may also identify problems, which will also require analysis and correction. The number of defects expected has been estimated as 10/year.

3   There may be corresponding NRS CSCI modifications as a result of the correction of PCRs.

4   Phase Two (2) – Task Two (2) - Analysis and Recommendation

During the analysis and design stage of this task, the contractor **shall**[1] conduct, as a minimum, the following :
   a   Utilize existing scenarios with modified existing code to demonstrate effects, with corresponding feedback into the design and solution evaluation process.
   b   Demonstrate the impact of requirements, including those on other protocols, presenting "why it is better".
   c   Analysis **shall**[2] be quantitative with a defined demonstration method and **shall**[3] use assessment criteria including latency, reliability, end to end delay and bandwidth utilization.

4.1.   Item 2 - Radio Silent Modification

The purpose of this Item is to analyze and determine potential modifications to the transmission of radio silent override data.

4.1.1. Problem Description

If a unit is requested to over ride the radio silent status to transmit a TSR, the default action of the SNC is to not only include the NP with the data, but also fill the rest of the timeslot with the padding technical messages. A worst case could be a 1½ second burst of transmission for a millisecond TSR. Consideration should be given to changing the Radio Silent transmission rules, such that only the TSR MP (NP) is sent and the rest of the timeslot is not used. Therefore reducing the time on air

ANNEX B - CONFIGURATION MANAGEMENT PLAN (CMP)

1   Configuration Management (CM)

This section is meant to give further and more detailed information than already given in Paragraph 6 of this SOW.

1.1.   Configuration Management Program

Following the guidance of ISO 10007:1995(E) and MIL-HDBK-61A, the Contractor **shall**[1] plan, establish, and execute a Configuration Management (CM) Program which provides an organizational structure having configuration identification, control, audit, and status accounting procedures for hardware and software maintained, modified or procured under this contract. The Contractor **shall**[2] perform CM activities in accordance with his PMP and CMP approved by the Government.

1.2.   Configuration Baselines

See discussion in the main body of this SOW.

1.3.   Configuration Control

1.3.1.   Government Configuration Control

The Contractor, with approval from the Government, **shall**[1] maintain configuration control of all documents listed in Annex C - Paragraph 2.1, identified as "Core". Any and all changes to these specifications **shall**[2] be submitted via a NILE Change Proposal (NCP), and a Specification Change Notice (SCN).

1.3.2.   Contractor Configuration Control

The Contractor **shall**[1] maintain configuration control of documentation and equipment not provided by the Government. The Contractor **shall**[2] maintain and control the configuration for the period of performance. The Government will monitor all tasks under Contractor configuration control and review any item via the IPT process.

1.3.3.   Configuration Identification

The Contractor **shall**[1] maintain/update configuration identification documentation. The documentation **shall**[2] identify all physical and functional characteristics necessary to define a CI throughout its life cycle. All documentation **shall**[3] include relevant information on change and traceability.

1.3.4.   Configuration Management Information System (CMIS)

₁ The CMIS **shall**^(1) contain all GFE/GFI with their current versions and status as of the beginning of the ISS Phase. During the period of performance version and status will change accordingly to the decisions taken in the Configuration Control Review Board.

₂ The changes will be initiated through Trouble and Problem Change Reports which will lead to NILE Change Proposals and finally into Software Change Notices. The complete process is described in the "Configuration Boards" section of this annex.

₃ The CMIS should be flexible enough to add other data if it is recognized as necessary during the period of performance.

1.3.4.1.   Trouble Reports (TR)

₁ Trouble Reports coming from Contractor testing process, integrators or operational use of NILE soft- and hardware **shall**^(1) be recorded, analyzed and resolved, using a Problem Tracking Data Base (PTDB).

₂ The Contractor **shall**^(1) enter Trouble Report data into the TR Database as required. Only the PMO and Contractor can update/edit reports. The Contractor **shall**^(2) have edit capability to input their own data and have read access to other reports in the TR Database provided by: (a) NILE PMO and (b) Nations/integrators.

1.3.4.2.   Problem Change Reports (PCR)

The Government will provide to the Contractor a database containing resolved and unresolved problems from the development phase. This database should be integrated in the PTDB. The PTDB will be maintained and updated under the leadership of the Government. The Contractor **shall**^(1) record its own Problem Reports in the PTDB. Appropriate configuration management and control action **shall**^(2) be taken by the Contractor.

1.3.4.3.   Change Proposal (CP)

The contractor will provide the documentation in which the engineering change of the NILE system is described.
Two different formats will be used for the proposed changes: Engineering Change Proposal (ECP) and NILE Change Proposal (NCP).

1.3.4.3.1.   Engineering Change Proposal (ECP)

₁ The Engineering Change Proposal **shall**^(1) be generated when the changes impact extensively the configuration items and affect a great amount of documentation. It will describe how the proposed change will be implemented along with providing estimated schedules and associated costs.

₂   The ECP will be discussed during a Configuration Control Review Board (CCRB) meeting where it will be finalized and sent to the Configuration Control Board (CCB).

₃   After the ECP has been approved by the CCB the Contractor **shall**^(2) generate a Notice of Revision (NOR) and a Specification Change Notice (SCN) for each document affected by the ECP.

₄   The changes and the system evolution already identified in the present SOW will not require an ECP.

1.3.4.3.2.   NILE Change Proposal (NCP)

₁   The contractor **shall**^(1) generate a NILE Change Proposal for any change of the system and/or the configuration items that are identified in Annex A (improvement Tasks) and for any software and hardware defect arising from TRs and PCRs.

₂   The NCP **shall**^(2) describe in details the suggested solution/evolution and how the change will be implemented and **shall**^(3) include a draft copy of the change pages to be incorporated in the affected documentation. The NCP will be discussed during a Configuration Control Review Board (CCRB) meeting where it will be finalized and sent to the Configuration Control Board (CCB).

₃   After the NCP has been approved by the CCB the Contractor **shall**^(4) generate a Specification Change Notice (SCN)

1.3.4.4.   Specification Change Notice (SCN)

₁   All activities above will finally result into the actual change. The Contractor **shall**^(1) produce a cover letter, the Software Change Notice (SCN), with all change pages attached to it. If the change pages are too numerous, a reprint of the document may be considered. The SCN **shall**^(2) contain all NCPs which are fully or partly resolved. This SCN will be the formal act for closing out the action (PCR, NCP, etc.) in the CMIS for fully resolved issues. A reference to the SCN is kept in the CMIS with the PCR/NCP.

₂   The Contractor **shall**^(1) post the SCN on the NILE Web together with the complete updated document.

1.3.4.5.   Evolution Database

During the In-Service Support Phase of NILE, updates to the ISS Product Evolution database **shall**^(1) be provided in line with any formal NILE software releases or in general whenever a NILE software / hardware component is affected.

1.3.5.   Configuration Boards

Configuration Control Board (CCB) and Configuration Control Review Board (CCRB) are described in the main body of this SOW. This section will address the Configuration Control Process with all actors and their responsibilities.

1.3.5.1.   Participants in the CM Process

The main actors in the CM process are:
a   National Representative (Steering Committee, national PM)
b   Program Management Office
c   Contractors

In this chart NATO appears as an actor, because they may influence the Data Link as well as the other actors may have influence on an existing STANAG or other NATO document.
Both types of processes will be described.

1.3.5.2.   NILE CM Responsibilities

Every participant has a role in the configuration management process to fulfill certain tasks:

1.3.5.2.1.   National Representative

The SC exercises executive-level oversight over all aspects of the NILE ISS Phase including Configuration Management. Decisions of the SC will be made unanimously. If the SC is unable to reach a timely decision on an issue, SC members will refer the issue to their higher authorities for resolution.
These rights can be delegated to the national Program Manager, as required.

1.3.5.2.2.   Program Management Office (PMO)

The PMO is involved in nearly all decisions regarding maintenance and documentation. The tasks are:
a   Support the Configuration Control Board (CCB) in Configuration Management and documentation
b   Evaluation of change proposals for cost, schedule, and technical aspects
c   Configuration Management of the upgrades and incorporating of improved changes
d   Establish and maintain the Configuration Management Information System
e   Development and publishing of change pages

1.3.5.2.3.   Contractors

The contractors have the responsibility to maintain the SNC/NRS, the LLC, and the MLTT (NCTSI). They will also assist the PMO to update the documentation. They further will assist the PMO in preparing board meetings and attend Working Group meetings on request.

a.   SNC and NRS Contractor
The contractor **shall**[1] maintain software, hardware and prepare documentation changes for SNC , NRS including MLTT-SNCd and MLTT-MS.

b.   LLC Contractor
The contractor **shall**[1] maintain software, hardware and prepare documentation changes for the LLC.

c.   In Service Engineering Agency (ISEA) for MLTT
The ISEA has the overall responsibility to maintain MLST3/MLTT software and hardware. They will integrate the results from SNC, NRS and LLC changes, assisted by the respective contractor as necessary.

1.3.5.2.4.   NATO

NATO will update NATO documentation accordingly to the DLCPs forwarded by the PMO.

1.3.5.3.   Institution

The CM Process will have two Institutions where decisions will be taken according to the level.

1.3.5.3.1.   Configuration Control Review Board (CCRB)

The CCRB will address trouble reports, change proposals, conduct analysis and evaluation, review recommendations, evaluate potential cost impact and provide recommendations to the CCB

1.3.5.3.2.   Configuration Control Board (CCB)

The CCB is the final authority for hard- and software decisions. Because of the nature of the system there are two different CCBs.

a.   NILE CCB
In the NILE CCB will decide all changes to SNC, NRS, and LLC soft- and hardware.

b.   Working Groups
Working groups assist the CCB to understand the nature of the problem and will recommend decisions.

c.   MLST3/MLTT CCB
MLST3 is the core part of the MLTT. MLTT is comprised of the MLST3 plus the Link22 functions. All decisions regarding MLST3 will be done in this section of the CCB. Decisions that affect the Link22 part or the interface between

MLST3 and the Link22 part will be made in the MLTT section of the CCB. ISEA will be responsible for the MLTT System where as the PMO is responsible for the Link22 functionality and the coordination of the integration into the MLTT

1.3.5.4.   CM Procedure

Generally trouble reports are expected from the nations. This doesn't preclude pre-planned modifications and functional extensions, which are introduced by the Government. The capability to react on changes in NATO documents is given by forwarding NILE Change Proposals, received from NATO authorities.

1.3.5.4.1.   TR, PCR, NCP

Trouble Reports (TR) are generally about soft- and hardware. Problem Change Reports (PCR) are software related only. NILE Change Reports (NCR) are either received from the NATO or the output of the CCRB.

1.3.5.4.2.   DLCP

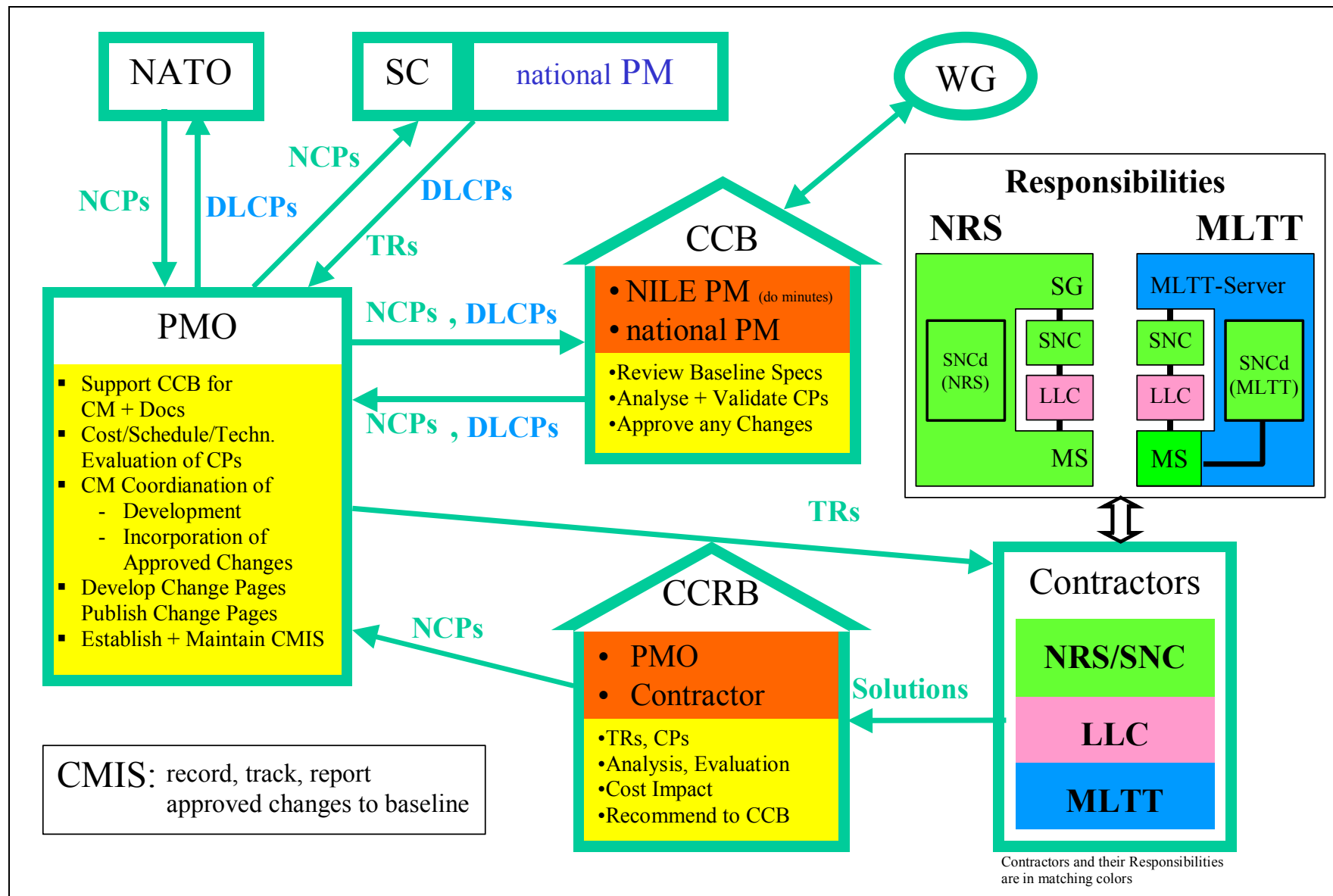DLCP are generated by the nations to change a NATO Standard or document.

Figure 6:   CM Process

1.3.6.   Configuration and Data Management

1.3.6.1.   Configuration Management

₁   The Contractor **shall**[1] be responsible for Configuration Management of Configuration Items delivered during this contract.

₂   The Contractor **shall**[1] identify a single authority within the Contractors organization who **shall**[2] be responsible for all configuration management and control. The Contractor **shall**[3] prepare, implement and maintain a NILE Configuration Management Information System (CMIS), tailored to the NILE In-Service Support phase.

₃   The Contractor **shall**[1] provide the configuration management process for identifying and controlling the evolving software products associated with the modification of the NILE SNC and NRS software. A Configuration Management Information System will be used to control software products in the identification, configuration control, status accounting, auditing, storage, handling, and delivery of the software/hardware and associated documentation through all phases of the ISS contract.

₄   The Contractor **shall**[1] primarily be responsible for the Configuration Control of baseline documentation, baseline items in the software development environment, and vendor supplied data. The Contractor **shall**[2] include the tracking of all Problem / Change Reports (PCR), Change Requests (CR), NILE Change Proposals (NCP), Engineering Change Proposals (ECP), Specification Change Notices (SCN), and Requests for Deviation (RFD).

₅   The Contractor **shall**[1] provide administrative services related to the convening of Configuration Change Review Boards (CCRB) and Configuration Control Board (CCB); such as, scheduling, assembling of items for resolution, and minutes.

1.3.6.1.1.   Block Cycles

Approved changes and prioritized problem reports **shall**[1] be implemented in block cycles as shown in Appendix A. Block cycle identifiers **shall**[2] be assigned to designate a specific configuration of software, hardware and documentation package delivered consecutively to the completion of modifications. The configuration will be established by the NCCB and documented in the approved CMP.

1.3.6.1.2.   Re-qualification

₁   Proposed engineering changes to the functional, allocated and product baselines **shall**[1] be analyzed by the Contractor to identify the impact upon qualification. If the proposed change affects the functional and allocated baseline, qualification and testing requirements **shall**[2] be assessed and **shall**[3] be submitted within the Engineering/NILE Change proposal.

2   If the proposed Class I change affects the product baseline only, the Contractor **shall**[(1)] submit for Government approval a Regressive Test Procedure. The Contractor's analysis of the required regressive testing **shall**[(2)] follow the guidance used in developing the First Article Qualification test (FAQT). The Regressive Test Report **shall**[(3)] be provided to the Government for approval. The report must indicate in which block cycle the change will be implemented. Any failures will require corrective action and re-testing by the Contractor. A Regressive test procedure/report may address more than one E/NCP. All Regressive Testing **shall**[(4)] be successfully completed before delivering the affected CI to the Government.

1.3.6.1.3.   Notice Of Revision (NOR)

After ECP approval The Contractor **shall**[(1)] submit an a Notice of Revision (NOR) that describes the proposed changes to a technical document. The NOR **shall**[(2)] include, where applicable, the following information:

  a   A listing of the identifier, revision level, and title of the affected document
  b   The identifier of the ECP which proposed the change
  c   A complete description of the changes to be made to the affected document.

Submissions of NORs are limited to changes affecting the functional and allocated baseline.

1.3.6.1.4.   Request for Deviations/Waiver

The Contractor **shall**[(1)] request deviations following the guidance of MIL-HDBK-61A and Paragraph 5.3.4 of the ANSI/EIA-649-1998, National Consensus Standard for Configuration Management.

1.3.6.2.   Data Management

1   The Contractor **shall**[(1)] identify a single authority within the Contractor's organization who **shall**[(2)] be responsible for data management efforts. The Contractor **shall**[(3)] implement and maintain the SNC and NRS data accession list.

2   The Contractor **shall**[(1)] process and submit the data items required by the CDRL. General instructions and requirements are outlined in the introduction to the CDRL. A data status listing of all engineering and management data generated internally by the Contractor **shall**[(2)] be placed and maintained on the NILE Intranet.

1.3.6.2.1.   Data Accession List

All documentation produced or prepared by the Contractor, sub-contractors, or vendors under this contract **shall**[(1)] be accessible to the Government. The Contractor **shall**[(2)] prepare and update quarterly a list of all generated documentation. This list **shall**[(3)]

be provided to the Government. Throughout the life of the contract, the Contractor **shall**[4] afford Government personnel free access to this documentation including providing it to the Government.

1.3.6.2.2.   Technical Data

The Contractor **shall**[1] update and maintain technical data to current engineering and test requirements for the life of the contract. In particular, traceability through the product and allocated/functional configuration baselines **shall**[2] be maintained.

1.4.   Engineering Support Services

See Paragraph 10 of this SOW.

1.5.   Website

See Paragraph 6.4 of this SOW.

ANNEX C – REFERENCE DOCUMENTATION AND PRODUCT MAINTENANCE RESPONSIBILITY REGISTER

1   Introduction

This Annex provides a full list of the technical reference documentation applicable to this contract and identifies those documents, which the contractor is required, as a minimum, to maintain (update, correct, amend, etc.) as part of the Items identified in Annex A of the SOW. Furthermore, this Annex identifies the products, including CSCI software modules, hardware and development and test support tools, that the contractor is required to maintain as part of the overall contract. Proprietary rights on current and modified documents, software and hardware are defined in the RFP.

2   Documentation List

The Government will provide Dates and Version numbers of the documents below at Contract Award.

2.1.   Link-22 System, SNC and NRS related documents

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
Acceptance Test Procedures for the NILE Reference System	LGN 156-05-005		Yes		Yes	
Acceptance Test Procedures for the System Network Controller	LGN 156-05-004		Yes		Yes	
Acceptance Test Report for the NILE Reference System	LGN 156-06-005			Yes		Yes
Acceptance Test Report for the System Network Controller	LGN 156-06-004			Yes		Yes
Configuration Item Development Specification for the NRS	LGN 156-12-001		Yes		Yes	

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
Specification for the NRS						
Configuration Status Accounting Report for the NRS	LGN 156-11-011			Yes		Yes
Configuration Status Accounting Report for the SNC	LGN 156-11-010			Yes		Yes
Database Design Description	LGN 156-03-003		Yes		Yes	
Data Extraction and Reduction Document	LGN 200-11-001		Yes		Yes	
Functional Baseline Description for the NRS	LGN 156-11-006			Yes		Yes
Functional Baseline Description for the SNC	LGN 156-11-007			Yes		Yes
Interface Design Description for the DLP-SNC	LGN 156-15-001		Yes			Yes
Interface Design Document for the Link Level COMSEC Segment	SCCI/SP/LLC-IDD		Yes			Yes
Interface Requirement Document for the Link Level COMSEC Segment	SCCI/SP/LLC-IRS	Yes			Yes	
Interface Design Description for the NRS	LGN 156-15-002		Yes		Yes	
Installation and Checkout (INCO) Test Procedures for the NRS			Yes			Yes
Interface Requirement Specification for Data Link Processing Segment and Link 22 System Network Controller	SCCI/SP/IRS (DLP-SNC)	Yes			Yes	

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
Link Level COMSEC Operators Manual	VSD-608518-98-355			Yes		Yes
Program Management Plan (PMP)	LGN 156-11-002		Yes		Yes	
Request for Deviation for the NILE NRS	LGN 156-11-005-1			Yes	Yes	
Request for Waiver for NRS	LGN 156-11-014			Yes	Yes	
Request for Waiver for SNC	LGN 156-11-014-1			Yes	Yes	
Request for Waiver for SOW	LGN 156-11-014-2			Yes	Yes	
Software Design Description for the System Network Controller	LGN 156-03-001		Yes		Yes	
System Installation Plan for the NRS & Interfaced SNC	LGN 156-05-006		Yes		Yes	
System Installation Plan for the System Network Controller	LGN 156-05-007		Yes		Yes	
Spare Part List	LGN 156-11-008		Yes		Yes	
Software Product Specification for the NILE Reference System (SPS)	LGN 156-11-012		Yes	Yes		Yes
Software Product Specification for the System Network Controller (SPS)	LGN 156-11-013		Yes	Yes		Yes
Media Simulation Software Requirement Specification	LGN 156-02-001		Yes		Yes	
Scenario Generator Software Requirement Specification	LGN 156-02-002		Yes		Yes	
System Network Controller Software	LGN 156-02-003		Yes		Yes	

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
Requirement Specification						
Segment Specification for the HF Fixed Frequency Signal Processing Controller	SCCI/SP/HFFFSPC	Yes			Yes	
System Specification for Link 22 (NILE)	SCCI/SP/L22	Yes				Yes
Segment Specification for the Link Level COMSEC Segment	SCCI/SP/LLC	Yes				Yes
System Specification for the NILE Reference System	SCCI/SP/NRS	Yes			Yes	
Segment Specification for the System Network Controller	SCCI/SP/SNC	Yes			Yes	
Segment Specification for the UHF Fixed Frequency Signal Processing Controller	SCCI/SP/UHFFFSPC	Yes			Yes	
Segment Specification for the UHF EPM Signal Processing Controller	SCCI/SP/UHFEPMSPC	Yes			Yes	
Technical Support Document for NILE in HF EPM Mode	NILE TSD	Yes			Yes	
Media Simulator Software Test Description	LGN 156-05-001		Yes			Yes
Scenario Generator Software Test Description	LGN 156-05-002		Yes			Yes
Final System Network Controller Software Test Description	LGN 156-05-003		Yes			Yes

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
System Technical Manual for the NILE Reference System	LGN 156-07-001		Yes		Yes	
System Technical Manual for the System Network Controller	LGN 156-07-002		Yes		Yes	
Media Simulator Software Test Plan	LGN 156-04-001		Yes			Yes
Scenario Generator Software Test Plan	LGN 156-04-002		Yes			Yes
SNC Software Test Plan	LGN 156-04-003		Yes			Yes
Software Test Report for the Media Simulation	LGN 156-06-001			Yes		Yes
Software Test Report for the Scenario Generator	LGN 156-06-002			Yes		Yes
Software Test Report for the System Network Controller	LGN 156-06-003			Yes		Yes
LLC Management – Natural Work Product			Yes			Yes
Media Simulation Control – Natural Work Product			Yes			Yes
Media Simulator Diamond – Natural Work Product			Yes			Yes
NRS-LLC Transaction Processing – Natural Work Product			Yes			Yes
Network Management Simulation for MS – Natural Work Product			Yes			Yes

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
PER Values – Natural Work Product			Yes			Yes
Media Timeslot Relationship – Natural Work Product			Yes			Yes
Remote Equipment Configuration – Natural Work Product			Yes			Yes
Ada Iteming and Message Communication – Natural Work Product			Yes			Yes
Scenario Developer – Natural Work Product			Yes			Yes
Scenario Generator – Natural Work Products			Yes			Yes
Data Analysis – Natural Work Product			Yes			Yes
Data Reduction – Natural Work Product			Yes			Yes
SG Server – Natural Work Product			Yes			Yes
SG Workstation – Natural Work Product			Yes			Yes
SG Extractor – Natural Work Product			Yes			Yes
SG Preliminary Design Database – Natural Work Product			Yes			Yes
SG Design Notes – Natural Work Product			Yes			Yes

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
SG Design Work – Natural Work Product			Yes			Yes
Utility Programs – Natural Work Product			Yes			Yes
Drivers – Natural Work Product			Yes			Yes
Glossary of Terms & List of Abbreviations	CI/GN/WP2	Yes			Yes	
Product Drawings and Associated Lists	LGN 156-03-002		Yes		Yes	
NILE Requirements Traceability Matrices			Yes		Yes	
Trouble Report Database ITR/STR			Yes			
Trouble Report Database PCR			Yes		Yes	
Data Link Processor Functional Requirements Specification (FRS)		Yes			Yes	
Tactical Data Link – Link 22 Tactical Message Standard	STANAG 5522					Yes
Tactical Data Link – Link 16 Tactical Message Standard	STANAG 5516					Yes
Standard For Data Forwarding Between Tactical Data Systems Employing Link 11/11b,Link 16 and Link 22 – Vols. 1 to 3	STANAG 5616					Yes
Standard Operating Procedures For Link 22	AdatP-22					Yes

Title	Document #	Functional Baseline	Allocated Baseline	Product Baseline	Core	Government Responsible
Standard Operating Procedures For Interoperating Data Links	AdatP-33					Yes
Technical Standard For Non-Hopping HF Communications Waveforms	STANAG 4539					Yes
Technical Standards for a slow hopping HF EPM Communications System	STANAG 4444					Yes
Technical Standard For Single Channel UHF Radio Equipment	STANAG 4205					Yes
SATURN – Fast Frequency Hopping EPM Modes For UHF Radio	STANAG 4372 (NATO Secret)					Yes
STANAG						

2.2.   MLTT Related Documentation

Title	Document_#	Version
Interface Design Document for the MLTT	LGN 109-03-002,	Version at Contract Award
System/Software Requirements Specification for MLTT	LGN 109-01-001	Version at Contract Award
Software Design Description for the MLTT	LGN 109-03-001	Version at Contract Award

3   CSCI Software Modules And Related Development And Test Support Tools

3.1.   SNC SW

Program/ Executable	File Name	Version Description
SNC on HP UX	SNC*	Nile SNC Version 6.1, Build Number 723
TOD Reader on HP UX	READ_TOD*	Nile UNIX Time Of Day (TOD) Reader Version 6.1, Build Number 724
SNC on Win NT	SNC.EXE	Nile SNC Version 6.1, Build Number 725
SNC on Sun Solaris	SNC*	Nile SNC Version 6.1, Build Number 726
TOD Reader on Sun Solaris	READ_TOD*	Nile UNIX Time Of Day (TOD) Reader Version 6.1, Build Number 727

3.2.   NRS SNCd SW

Program/ Executable	File Name	Version Description
SNC♦ Control	SNC_DIAMOND_ CONTROL.EXE	Nile SNC Version 6.1, Build Number 721
SNC♦	SNCD.EXE	Nile SNC Diamond Version 6.1, Build Number 722

3.3.   NRS MS SW

Program/ Executable	File Name	Version Description
Media Simulation	MSCserver.EXE	Nile MS Version 4.03

3.4.   NRS SG SW

Program/ Executable	File Name	Version Description
Main Programs		
Scenario Developer	SD.exe	Nile SD Version 20.0
Scenario Generation	SG.exe	Nile SG Version 20.0
SG Server	SGSV.exe	Nile SGSV Version 20.0
SG Extractor	SGEX.exe	Nile SGEX Version 20.0
SG Workstation	SGWS.exe	Nile SGWS Version 20.0
Data Reduction	DR.exe	Nile DR Version 20.0
Data Analysis	DA.exe	Nile DA Version 20.0
Minor Programs		
Workstation Service Operator Interface	WSS.exe	Nile WSS Version 20.0
Workstation Service	WSService.exe	N/A
Read GPS	ReadGPS.exe	N/A
Create Menus	CreateMenus.exe	N/A

3.5.   NRS HW

The hardware set will comprise NRS items purchased under the Engineering Support Services CLIN (SOW Paragraph 10.g) and Government Furnished Equipment (GFE) specified in Appendix F

3.6.   MLTT SNCd and MS SW

MLTT code is under development; the software modules relevant for this contract are listed below.

Program/ Executable	File Name	Version Description
Main Programs		
MLTT SNCd	N/A	Version at Contract Award
MLTT MS	N/A	Version at Contract Award

3.7.   MLTT HW

The hardware set will comprise MLTT items purchased under the Engineering Support Services CLIN (SOW Paragraph 10.g) and Government Furnished Equipment (GFE) specified in Appendix F.